COAL AGE

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Combinations in Restraint of Trade.

By R. DAWSON HALL

SINCE the fourteenth year of the reign of Edward VI little doubt has existed in Anglo-Saxon communities that combinations in unjust restraint of trade are illegal. In fact under the act of that year large combinations to conduct trade, "engrossers" the legislation termed them, were in their very nature illegal. The Sherman Act merely made more specific, what was generally a part of the legal heritage of all Anglo-Saxon peoples. The courts have, however, in a degree interpreted the Sherman law "by the light of reason." The public is beginning to feel that the purpose of combination is more important than the combination itself.

In no matter has the public been more tolerant of combinations in restraint of trade than in the matter of labor. The present Federal Administration has not only recognized such combinations but has openly sponsored their formation and called for the "coöperative bargain." It has required of corporations that they meet such combinations though they have been created in restraint of trade and has excused its action by declaring labor not to be a commodity, though labor is bought and sold and enters everything bought and sold.

It is as useless to deny that labor is a commodity as to question any of Newton's Laws of Nature. Its quality is inherent and denying it will not change its character. A new name, if it will not properly define it, will not be a name at all. A new attitude to it will be like a new attitude toward water. We may hold that water will flow up hill, but with persistence it will show us that the new attitude has not changed the character of that fluid. It will still flow down hill whenever it is released from restraint.

It is considered a heresy today, to declare labor a commodity, but seeing that it is a commodity and nothing else, the denial will be as hopeless as was the censure pronounced on Galileo, when he averred that the earth revolved around the sun and not the sun around the earth.

What then? If combinations of laboring men, and the strikes which follow them, are indeed combinations in restraint of trade, shall we make laws to suppress them? Not at all, if the combinations are for proper purposes, and the strikes are for fully justified ends.

But the public is beginning to see that justice is not the end, though it may be the cause of such combinations, and the tendency now is to condemn all combinations and all strikes however caused, however much justified and however conducted. The pendulum is swinging against unions because they have gone over far and are making modern life impracticable.

The mechanism of production and distribution is being ruptured. A few men by breaking a link in the chain can make the whole concatenation useless. By breaking the links in turn or altogether they can remove the girdle by which civilization has been kept intact.

The public is not a most discerning body. During the war men of German birth, name and ancestry were all more or less suspected. A ban went forth against them all whether well affected or disaffected, and it was only with difficulty that the public exercised its power of discernment and kept that poise which is a nation's most prized possession.

The same result may be expected in our relations to unions and strikes. We may easily travel too far in our opposition to them. Workingmen of union affiliations may well beware. The word "trust" has had an ugly sound for years, and the word "union" may have no better treatment.

The law if clearly against public opinion makes martyrs, which prisons later canonize, but public opinion often transforms men of blameless character into criminals, so much stronger is popular conviction than the mere processes of law. One stigmatizes the individual and the other merely sequestrates his person.

Strong Background for Community Work Is Formed by Bathhouses and Laundries

Keystone Coal and Coke Co., Greensburg, Penn., has completed installation of bathhouses and laundries with excellent results. Forty per cent. of the work at the miners' homes has been done away with and a general improvement of health conditions noted

By Donald J. Baker
Pittsburgh, Penn.

After the influenza epidemic of 1918 had taken its heavy toll of lives from the mining communities, a coal company in western Pennsylvania that was among the first to realize that another such visitation would result in an even greater catastrophe, unless precautions were taken beforehand, was the Keystone Coal and Coke Co., of Greensburg. That cleanliness is next to godliness was the principle upon which this company started the work of safeguarding the health of the populace in its mining towns. This theory, by being applied in the form of community bathhouses and laundries, has already worked out far beyond the original hopes and expectations of those men in the company who were at the head of the movement.

The motive at the start was purely an unselfish one, having for its chief concern the foreign-born miner who either had not the opportunity to practice the simple laws of self-sanitation or was unfamiliar with them; so that when the germ of influenza was attracted to the miner's home, perhaps by overcrowded conditions, it was aided in its conquest by the general atmosphere of uncleanliness that prevails at the houses in nearly all small coal towns.

When the pall had finally been lifted and conditions returned to normal, a plan was started to install combination bathhouses and laundries at every one of the 30 operations of the Keystone companies, of which 15 lie in the Greensburg district.

It was no easy task that was outlined, since there was no background for starting. No design for such a type of building was at hand, for the idea was new. That four such installations have already been made and are in operation at the different Keystone plants is really remarkable when the short space of time that has elapsed since the epidemic is considered.

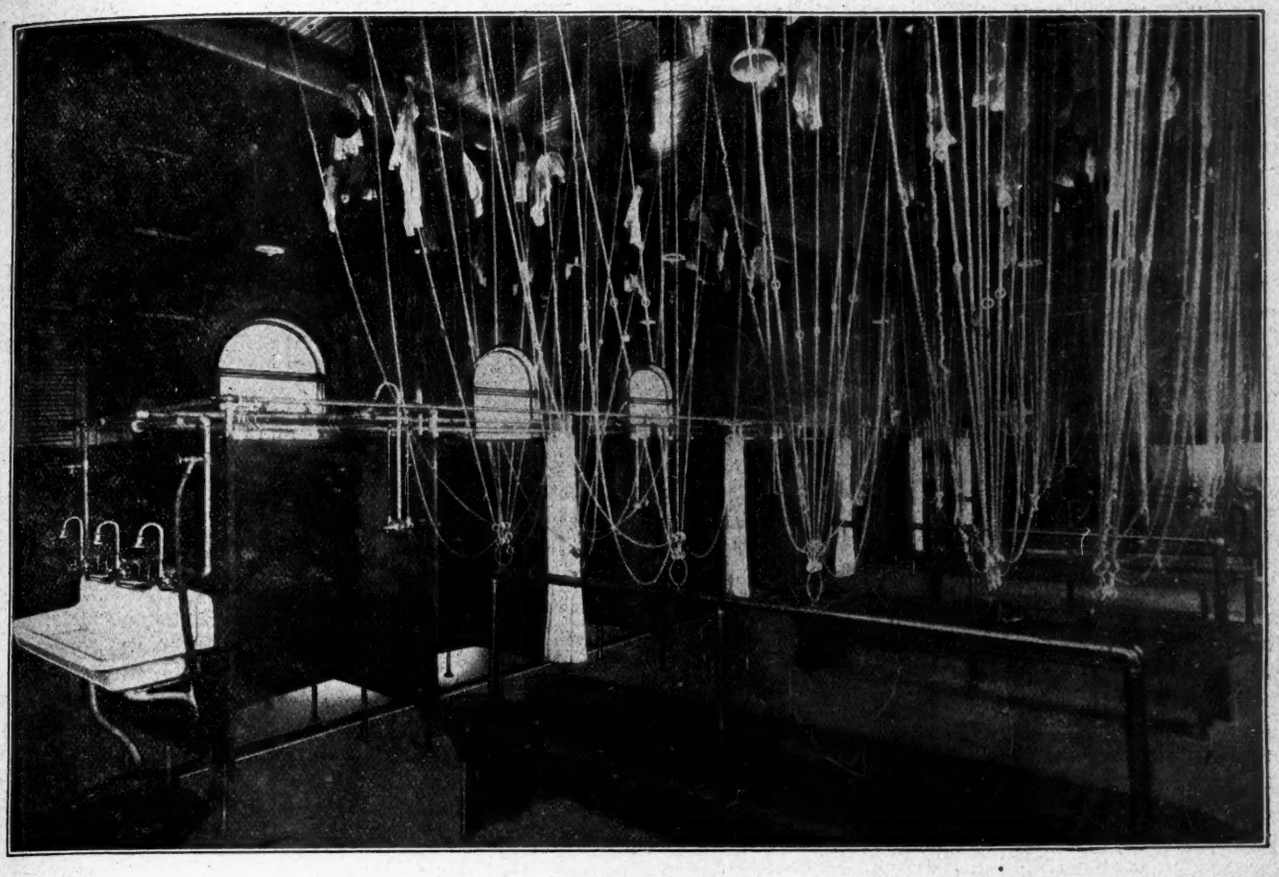
The illustrations used in this article are made from photographs of the original installation, completed some time ago, at the Keystone shaft, 8 miles southwest of Greensburg. Operation has been going on for some time, with splendid results.

It would be of interest to study the original installation as brought out in the pictures, and which with small changes will serve as a model for all future installations to be made by the Keystone Coal and Coke Co. It was of course impractical at the start to design a building with dimensions that would be standard for all of the communities, owing to the extent and variance in size of the different operations. An old brick compressor room at the Keystone shaft was utilized for the first experiment. Five concrete stalls were constructed, as can be noticed in the background of the illustrations showing the shower room. However, the idea of this sort of construction was abandoned, as it was thought that this type would leave much to be desired in the way of keeping the completed installation clean. One-inch slate slabs were then placed in the position shown, on a 42-in. square spacing, and the overhead piping installed. Connection was made to a boiler heater in the adjoining room for the hot-water supply. The cantonment type of shower head was used, which is adjustable and fitted with a ball joint connection. These fixtures were furnished by the Bailey Farrell Manufacturing Co., Pittsburgh, Penn.

The shower heads permit a maximum passage of 4 gal. of water per minute. The temperature of the water is regulated by a handle controlling both hot- and cold-water valves, the arrangement giving any desired temperature from cold to hot. A thermostat on the hot-water pipe, at a point where it enters the building, regulates the temperature of the water so that the hottest water that can be passed through the shower heads is but 110 deg. This temperature is believed to be as hot as can be withstood, and prevents any accidents that might occur through horseplay among the men if the water were allowed to come direct from the heater. The thermostats installed are manufactured by the Robertshaw Manufacturing Co., Youngwood, Penn., and are adopted as a standard. They can be adjusted to any desired temperature and are extremely simple and reliable.

The slate slabs were raised 10 in. from the floor and supported by cast-brass piping. The distance from the floor has been decreased in later installations to 4 in., so as to prevent an undue amount of splashing from adjacent stalls. Duck curtains are available for each compartment, to give privacy if desired, but these are scarcely ever used. Brown curtains have been substituted at the later installations, and these give the compartments a far neater appearance. The floor is of cement, and each compartment drains into a gutter running longitudinally through the entire system of stalls. Toilets, urinals, lavatories and drinking fountains are a part of the equipment in each bathhouse.

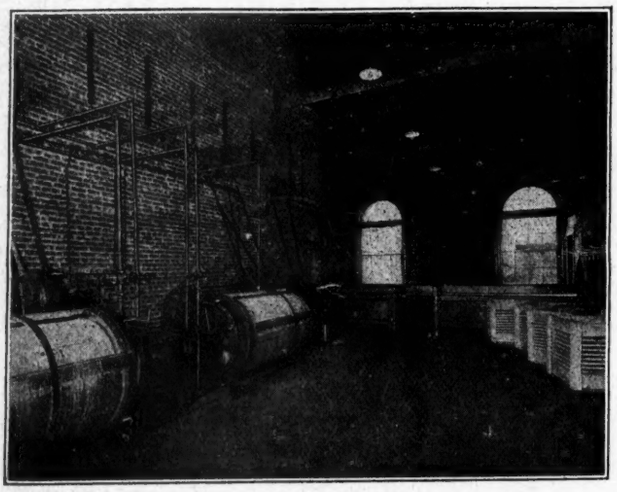
The overhead system used for holding clothes is unique and has given greater satisfaction than a locker arrangement. No. 2 sash chain is run through pulleys on a 27-in. spacing on the ceiling and connected by a hook to a ring on the piping that is used for a back support with benches. A wire basket is connected to the chain, which is raised or lowered by running through the pulley. The baskets, as can be seen, afford ample



Two views of the interior of the Keystone company's bathhouse at Keystone Shaft, Greensburg, Penn., showing the general scheme of installation

room for towel and soap, while directly under them are hooks for suspending the garments. This allows of a better circulation of air through the clothing, which therefore dries much more quickly than if hung away in lockers. The baskets as well as most of the fixtures were made at the Keystone shaft shops.

The spacing of the pulleys is such that no clothes from adjoining hooks can touch, no matter how crowded. A man acting as janitor is stationed in the building, and his duty is to keep the room scrupulously clean as well as guard the suspended clothing. It is possible, however, for any individual to lock his chain to the ring in the piping; but this is scarcely ever necessary because of the vigilance of the janitor, who is acquainted with all of the men at the mine.



LUTES SINCLAIR WASHING MACHINES, WITH CENTRIFUGAL DRIER IN REAR

What has proved to be an even greater success than the bathhouse is the community laundry which is located in the same building. Three washing machines, manufactured by the Lutes Sinclair Co., of Benton Harbor, Mich., have been installed in one end of the compressor room at the Keystone shaft, and adjoin the bathhouse. Two washing machines have 36-in. cylinders, with six compartments each. The other is a "baby washer" 30 x 30 in. They are operated by belt drive from a shaft driven by a 5-hp. Westinghouse motor.

A stamped laundry bag made of duck material is given each family, as well as a box of pins stamped with a number to correspond with that on the bag. On each article to be washed a pin is placed, and the bag of clothes is then taken to the laundry. The girl in charge of the laundry is able to take care of 25 family washings a day. She assorts the clothes according to whether they are white, colored or woolen, each lot being washed separately. The allotment of soap used in the washing process has been scientifically determined by expert chemists. After washing, the clothes are rinsed and passed through a bluing solution, thence to a centrifugal drier, which can be seen in the background of the view of the laundry. The drier revolves at 1500 r.p.m., and ten minutes' operation suffices to practically dry the clothes. Just enough moisture remains in them to permit of easy ironing.

The entire process from the time the clothes are assorted and placed in the washing machine to when they are removed from the drier consumes but one hour. As the clothes are removed from the drier they are assorted by the numbers on the pins and placed on hooks bearing the corresponding number. Here they are allowed to hang until the different pieces of goods have likewise been washed and dried, when all are gathered together and placed in the laundry bag.

The laundry room has a cement floor. The proper mixtures of hot and cold water are controlled by valves at the head of each washing machine. Special periods have been arranged for washing the mine clothes of the men. The laundry is self-supporting, a small nominal fee being charged each family to cover the cost of soap, bluing and general maintenance. Hand in hand with the bathhouse and laundry installations of the Keystone Coal and Coke Co. has been another innovation in safeguarding the health of the community. A professional nurse is stationed at each operation. The work of the nurses is varied and of considerable importance. Cases of sickness are watched over and recommendations made. Community visiting is done by the nurse, in which talks and helpful hints are given the women of the families in regard to better housekeeping, self-sanitation and the prevention of disease. Lessons are also given in domestic science.

Each nurse is required to furnish a weekly report, showing the number of houses visited, and a periodical visit is made to each home. All cases of sickness are reported. In this manner the company officials know at all times the exact health condition of each community. The nurses also assist the mothers in bathing the children at the bathhouses, for which special morning periods are allotted. The younger element of the town also have their bathing periods. The miners and their families have taken kindly to the new health work, and a much better morale has resulted.

The entire scheme of community bathhouses, laundries and professional nursing has reduced sickness at the Keystone company's mining towns to the lowest degree that has ever been recorded. The miner, as he comes to the surface at the end of the day, goes to the bathhouse, where he bathes and changes his clothes. The mine clothes are left at the bathhouse and never see the home. The men go home clean and in a happy frame of mind. The heating of water for bathing at home has been done away with, as well as the hard labor incident to washing the clothes for the usually large families in miners' homes. It is estimated that 40 per cent. of the work that used to occupy the time of the wife at home has been removed. Consequently, this leaves time for the improvement of the household and permits of more attention being given to the children. The time that used to be taken up by the men in laborious washing after the day's work is used in improving the appearance of the home.

It is really surprising to note the number of attractive lawns and gardens that have suddenly sprung into existence during the short time that the community work has been in operation. No part of the scheme is compulsory, although it is advised. It is taken by the people as an opportunity, as they realize the desire of the company to help them.

Of the four completed installations, all are at mines in the Greensburg district. The operation at the Keystone shaft employs 300 men and has a daily output of 2000 tons through a 300-ft. shaft. Another installation is at the Crow's Nest mine, where 400 men are employed; 2500 tons daily is the output here from a 9000-

ft. slope. A special brick building has been constructed here, which contains a bathhouse, laundry, boiler room and first-aid and mine-rescue station. The general scheme carried out is the same as that at the Keystone shaft, except that instead of using slate slabs for making the stalls in the bathhouse, 2 x 4's form a framework over which sheet zinc has been placed. This type of construction is considerably cheaper than the other and is just as easy to keep clean. As a result it is planned to use the zinc sheeting construction in the other installations that are now under way. The laundry equipment at this plant is direct-motor drive. Another installation is at the Sewickley mine, where 150 men are employed. The output of this plant is 1000 tons daily through a slope. The fourth installation has recently been completed at the Salem mine, and the installation at Huron is now under way. All of the plants mentioned above are within ten miles of Greensburg.

First-aid and mine-rescue teams are maintained at all of the operations, and these are directed by William Nesbit, who has been an employee of the company for 35 years. Mr. Nesbit inspects the mines and makes suggestions and recommendations for improving the general safety methods in use. He also has charge of the training of the personnel of the first-aid and mine-rescue teams. Company meets are held frequently. The National Bureau of Mines meet in Pittsburgh during September will be represented by strong teams from the Keystone Coal and Coke Co. operations. Ten oxygen helments and two lungmotors, manufactured by the Life Saving Devices Co., of Chicago, Ill., are kept in the main office at Greensburg. These are tested at regular periods and kept in condition for immediate service.

H. F. Bovard, general manager of all the Keystone interests, has been at the head of the community work movement, and it is mainly through his untiring efforts that the bathhouse and laundry installations have been so successful.

Loose Roof Is Dangerous

That some of our employees do not pay sufficient attention to the fact that loose roof is dangerous is shown by the following accidents which happened during the first half of this year. All of these mishaps could have been prevented by the exercise of greater care.

One man was killed, nine injured, sustaining disabilities of over five weeks, and four were off duty for shorter periods of time, involving an absence from work ranging from one to five weeks, because they neglected to timber or take down dangerous material such as bone coal, drawslate and loose rock.

A miner, while lying down to mine coal, had a piece of drawslate 3 x 4 x 8 ft. fall on him, breaking his back. He is totally disabled for life because he took a chance. A number of other men in the same way received broken arms and legs. A few got off with bad bruises. Loose roof is always dangerous, and we who work in the mines must pay the strictest attention to it. While taking down loose roof three men received injuries causing disabilities of from one to five weeks. These accidents occurred from three types of oversight: (1) Not expecting so much rock to fall as was actually brought down; (2) using a pick instead of a bar, and (3) not providing enough room to permit stepping back safely when the material fell.

Returning under dangerous roof killed two men and injured two others, causing them to lay off for two months. These accidents occurred because men went back into pillar workings after the coal track and timbers had been pulled. It is not known why one of the men (who, by the way, was killed) went back, but in the other case the man entered the abandoned place with the foreman, to show him the condition of the place, and while there struck a crushed stump with his pick and immediately the entire place fell in.

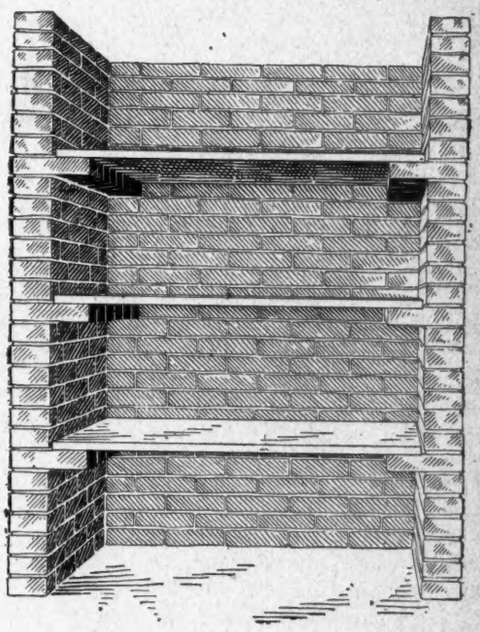
In another instance a man needed a block to put over a post. He saw one back in the gob and went to get it, but just then some of the roof fell and he got a broken leg. One man went back to get a shovel, and though he heard the roof begin to crack he continued on his way and lost 58 days from being crushed through the hips by a fall of slate.

These occurrences show that there is only one safe method to pursue, and that is to keep out from under dangerous roof. And the roof in pillar work is always dangerous after the coal has been taken out and the place made ready to fall.—*Mutual Monthly Magazine of Consolidated Coal Company.*

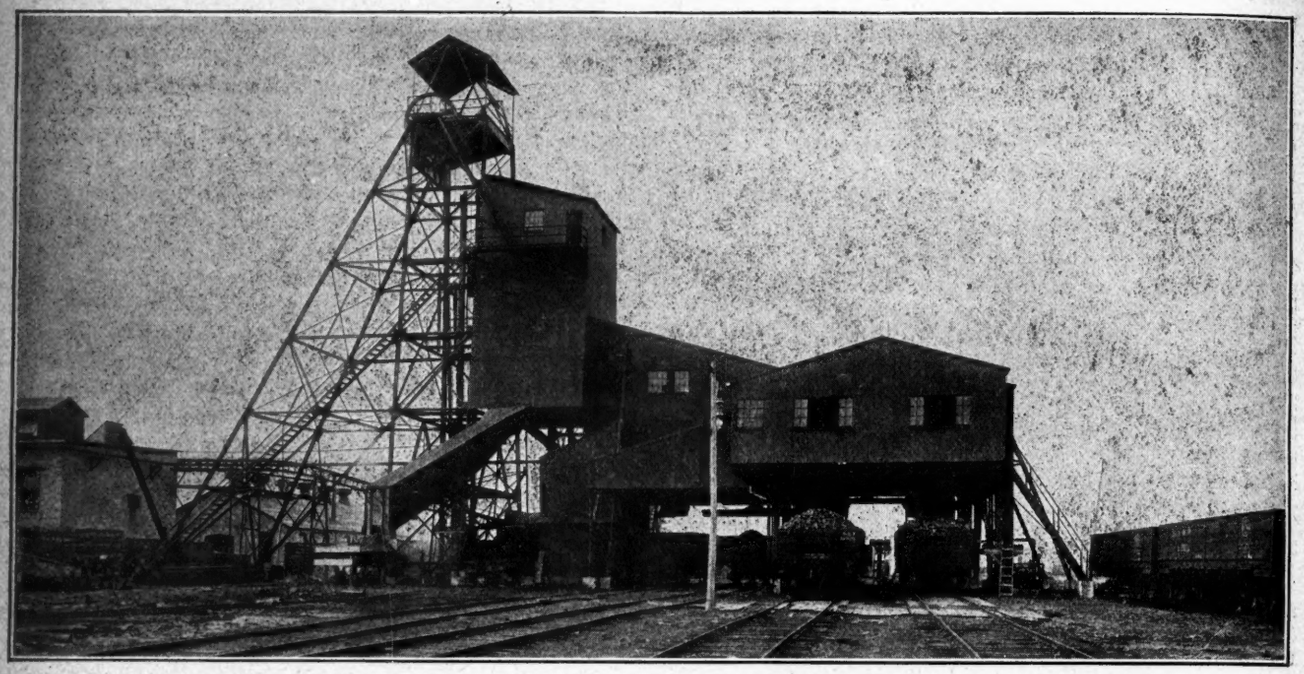
Shelf Supports for Mine Foreman's Office

By Ralph W. Mayer
California, Penn.

When an underground office for a mine foreman is being built, rectangular holes are often dug in the coal at the sides for closets, in which to keep supplies or records. These holes, or closets, have to be lined with brick, and when building these the masons can easily



make supports for shelving, with no extra work or expense. Every 18 in. or 2 ft., according to the distance it is desired to have the shelves apart, one of the courses of brick, preferably a header course, may be set with half the width of the brick exposed beyond the face of the wall. The course of brick in the opposite wall at the same height is also allowed to project. These projecting bricks make substantial supports for boards cut the proper length for shelving.



GENERAL VIEW OF THE SURFACE PLANT

A Model Illinois Coal Mine*

The Nokomis Mine is one of the few operations in Illinois or elsewhere using direct current for haulage and alternating current for cutting and other purposes. Underground shops and substations are also unique, although not altogether new features of this mine.

THE Nokomis Coal Co.'s mine at Nokomis, Ill., 72 mi. northeast of St. Louis, in Montgomery County presents an example of mining practice that is in many respects, a model for conditions in the central field. In 1912, the Nokomis Coal Co. was organized and acquired mining rights about a mile southwest of Nokomis. The company now owns or controls more than 12,000 acres. The bed worked is the No. 6, which lies 650 ft. below the surface, and ranges from 7½ to 9 ft. in thickness, averaging 8 ft. 4 inches.

The company selected Joseph P. Hebenstreit, a mining man of many years' experience, as its superintendent, and early in 1913 the main hoisting and air shafts were sunk. These are 17½ x 11½ ft. in size inside the timbers, and are 500 ft. apart, the air shaft being due west of the two-compartment hoisting shaft. The material encountered in sinking varied from hard limestone to layers of shale and even indurated clay, sand and gravel. Immediately above the coal lie 6 to 9 ft. of slate and shale, with two 5-ft. beds of lime rock, permitting the rooms to be opened 28 ft. wide.

The shafts were sunk in rapid time, facilitated by a systematic organization and careful planning. Sullivan air-jet, sinker, hand-feed, hammer drills were employed, using hollow steel with six-point rose bits. Three 8-hr. shifts were worked, each crew consisting of four drillers, four muckers and a shift boss.

The use of hammer drills accomplished a large economy of time and labor cost as compared with hand drilling. A Sullivan straight-line, steam-driven compressor supplied air for the machines.

Holes 4½ ft. deep were drilled, and a round of 8 to 10 holes were frequently drilled in 45 to 75 minutes in the soft shale. In the hard limestone, 28 to 32 holes per round were required. The labor cost was $93 for both shafts. As the average footage per 24 hours was 4.5 ft. advance as compared with 3.5 ft. for hand-sinking, the saving by using hammer drills amounted to twice $26.50, or $53 per day on the two shafts.

The Nokomis mine is developed on a modified room-and-pillar system, which practically amounts to the panel method. Instead of running the main entries north, east, south and west from the bottom, these are driven at an angle of 45 deg. so that the mine is divided into four main territories, northwest, northeast, southeast and southwest. This arrangement gives certain advantages in ventilation, which will be referred to later. The barrier pillars on the main entries are 150 ft. thick. All entries are 12 ft. wide and air courses are driven 22 ft. in width with an entry pillar of 30 ft. of coal. The air courses are made permanent by dropping the slate. Cross entries are carried at right angles to the main entries, approximately 600 ft. from center to center, and on the cross entries the rooms are opened on 60-ft. centers with 12-ft. room necks and 28-ft. rooms, leaving a pillar of 32 ft., of coal between each two rooms. The rooms are carried 250 to 270 ft. in depth with cross-cuts at intervals of 60 ft. and 12 ft. wide. Cross-cuts on the entries, however, are 10 ft. wide.

On the accompanying mine map, the rooms sketched in outline around the main bottom have all been worked out; and as each area is completed, the entries leading to it are walled off by concrete stoppings, so as to close off the inactive portions of the mine altogether.

The mine is at present working the areas indicated

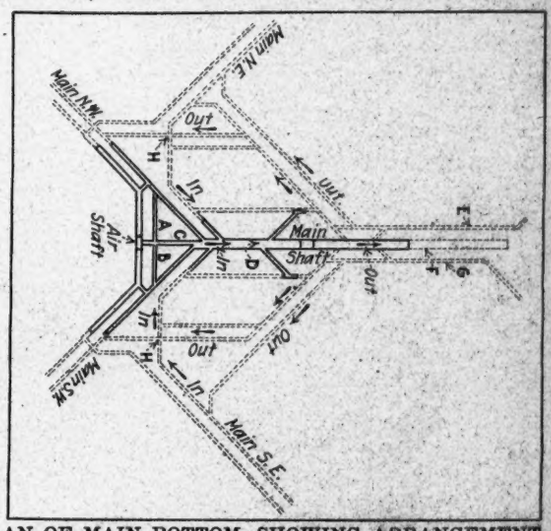
*Abstracted from *Mine and Quarry*.

by solid black oblongs, showing the depth to which the different rooms have been carried.

The main bottom, the heart of the underground workings of the mine, is an interesting place and naturally the busiest locality in the mine at all times. As stated, the hoisting and air shafts are 500 ft. apart, the latter due west of the former. This distance is more than abundant for perfect safety. The main bottom itself is 950 ft. long with over 450 ft. of space west of the hoisting shaft. The bottom is lined with concrete throughout. All coal comes into it from the west and all empties leave the shaft and proceed to the east before being returned to the outer workings.

The main bottom is 22 ft. wide, giving ample space for handling the cars, locomotives and other equipment. In stations driven from it are found an underground concrete-walled power house where the electric motor-generators, motors and switchboards are situated; a concrete repair shop with electrically driven grinders, drill press, a small lathe, etc., where mining machines, tools and locomotives may be completely dismantled if necessary, and major repairs made; a stockroom also lined with concrete, systematically arranged with bins and storage trays for practically all repair parts and supplies needed in the operation of the mine; a recharging station with double tracks and pits under each with sufficient accommodation for 20 electric storage-battery locomotives to be recharged at the same time; a blacksmith and forge shop and toilet facilities for the men. The entire bottom is fully electric lighted and all work rooms are concreted. The accompanying illustration shows the arrangement of run-arounds for bringing the loaded trips into the bottom and for returning the empties to the proper quarter of the mine.

The track gage is 42 in. In the main entry and in the bottom, 40-lb. steel rails are used, while 30-lb. rails



PLAN OF MAIN BOTTOM, SHOWING ARRANGEMENT OF ENTRIES, RUN AROUNDS, ETC.

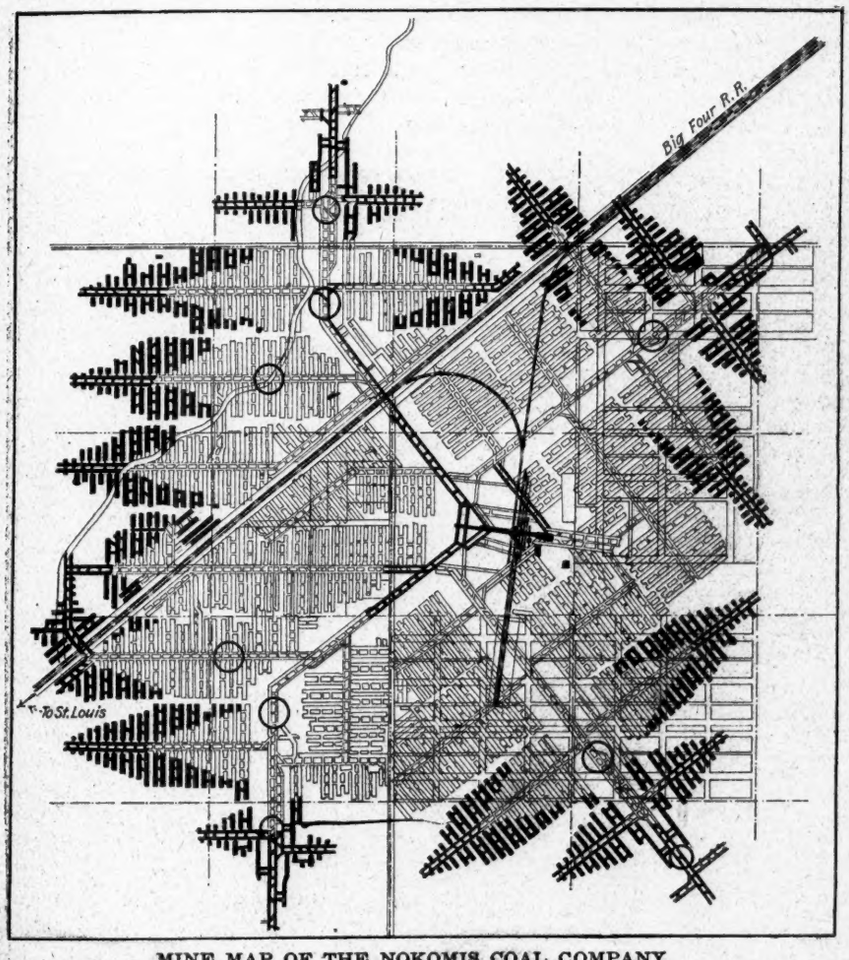
A—Power house. B—Locomotive charging station. C—Repair shop. D—Main bottom. E, F and G—Empty car storage tracks. H—Underpasses for empty cars. Arrows indicate direction of cars

are employed on the cross and stub-entries and in the rooms. All curves and turns are laid out at as flat an angle as possible in order to eliminate the danger of derailing cars. The track is carried down the center of the room for convenience in handling the mining machines, as well as in loading. Standard mine cars of 5-ton capacity are employed, built of wood with roller bearing trucks and draw bar springs.

Animal haulage has been entirely done away with in this mine. The cars are gathered from the rooms and entries and returned to the working places by means of electric "mine mules," or storage-battery locomotives, of which 17 are at present employed, 7 of these being Mancha and 10 Whitcomb locomotives. Six sets of Edison cell batteries have been installed recently. These motors pull the loaded cars out of the rooms, gather them in trips of from 6 to 10 and haul them to the partings, where storage tracks are provided for the loaded cars and for empties. The process is reversed in distributing the empties to the rooms.

At the partings where the inside workings connect with the main entries, the trolley locomotives, of which there are four, two of six, and one each of 10 and 15 tons capacity, haul the trips to the main bottom and return the empties to the partings.

At the shaft bottom, two tracks are provided, one for each of the



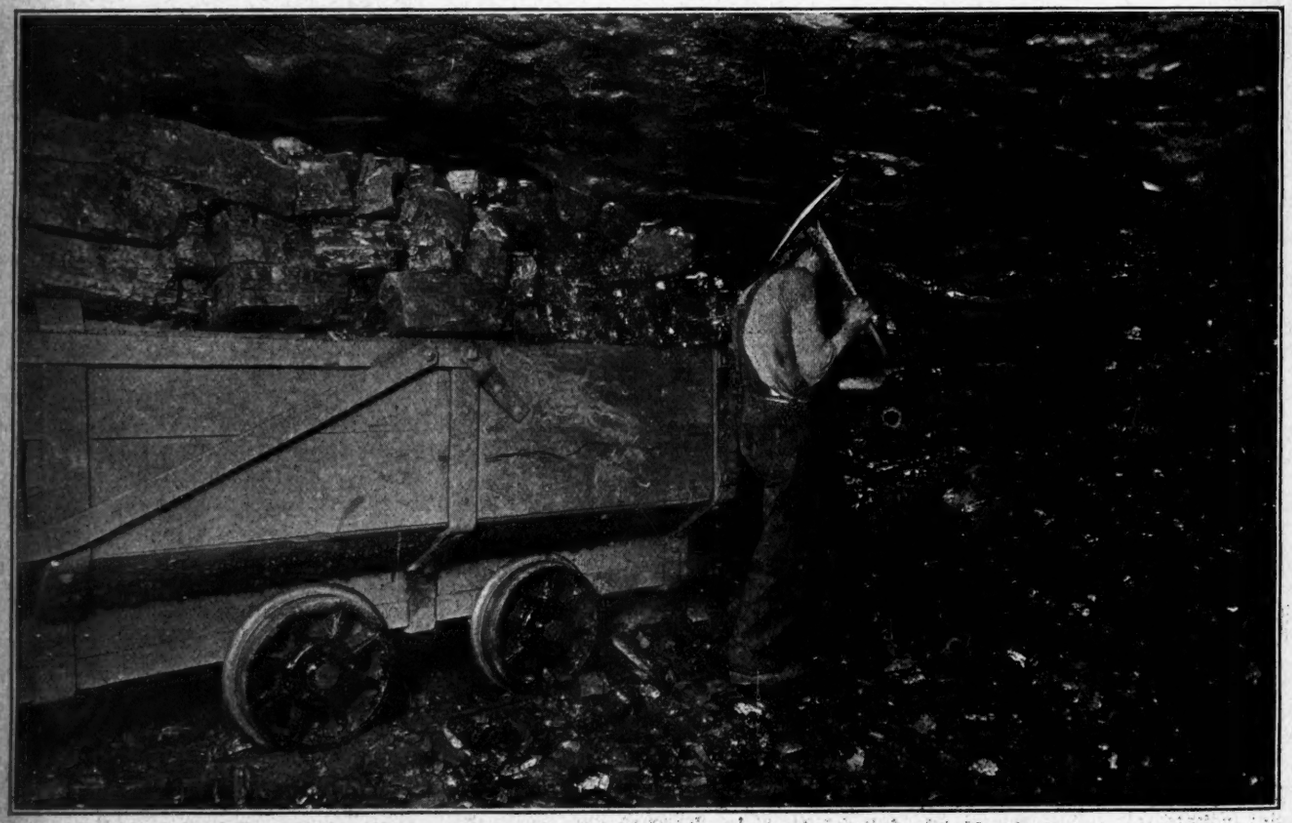
MINE MAP OF THE NOKOMIS COAL COMPANY

Black portions show operations in 1918-19. Light portions are worked out areas. Circles indicate transformer substations. Outer circle of two on same entry shows the site to which the inner substation will be moved as mine is developed.

COAL CUTTING MACHINE AT WORK IN A ROOM

two hoisting cages, and there is a slight down grade to the cages, equipped with the usual trips and safety catches for rapid handling of the cars. When it is noted that the full working capacity of this mine is 5000 tons per day, meaning 1000 hoists, it will be seen that rapid and accurate work must be provided for, and the equipment at hand is calculated to do the work safely and continuously. The storage-battery locomotives will operate under full load for from 8 to 10 hours without recharging. Four locomotives are operated at night for distribution of timbers, concrete, powder and other material.

Loaded coal cars enter the bottom over four separate lines from the four quarters of the mine. Large storage space east of the shaft in the main bottom and on adjacent side tracks permits prompt and ready handling



LOADER AND CAR OF COAL, SHOWING LARGE PERCENTAGE OF LUMP AFTER MACHINE MINING

of empties, and enables the trolley locomotives to pick up full trips at all times for distribution to the partings.

The uninterrupted and safe passage of loads and empties is provided for by under-passes at the points *H* indicated on the bottom diagram. These have been constructed under the main haulage lines, coming from northeast and southeast, so that empties bound to the southwest and northwest pass under at these intersections. This makes all territories independent, and avoids conflicts of locomotives arriving at and leaving the bottom.

All roadways in the entries are maintained in the best condition, the track being laid on substantial oak ties, carefully leveled, making a smooth-running road bed.

The east side of the shaft is double-tracked for 600-ft. in order to handle empty cars. The slate and shale is shot down and the walls are concreted. This gives overhead room for a second floor for the miners as they come out, go up stairs and wait until quitting time. This space is arranged with benches to accommodate 700 to 800 men. This avoids the presence of men on either full or empty tracks, and also prevents them from going across tracks. When ready to go out a man at the foot of the steps controls them by allowing not over 20 persons on a cage.

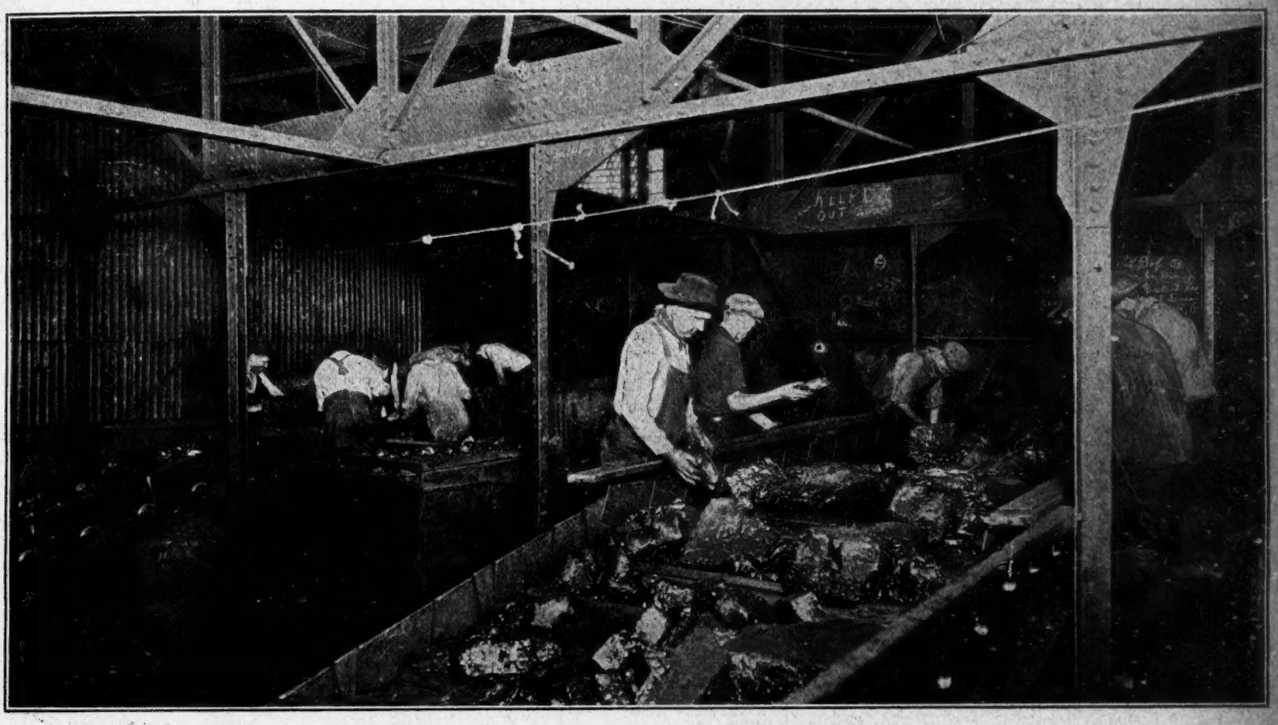
As previously stated, the air shaft is 11½x17½ ft. in size, and is situated 500 ft. from the hoisting shaft, so that in case of accident in the latter, the lives of the men underground would not be imperiled by a resulting accident at the same time to the air shaft. The mine is ventilated by a Sullivan steel-plate, high-speed reversible fan 10 ft. in diameter by 6 ft. in width, of the double-wheel type with conical steel-plate deflectors and multiple vanes or blades. It is operated as a blower, taking air down the shaft and forcing it through the mine workings and up the hoisting shaft. If desired, the fan may be reversed in less than two minutes, so as to exhaust, without changing any doors. The fan is well housed in a permanent brick building. It is operated by direct connection to a Brownell high-speed steam engine, the entire installation being a substantial one and kept in the best possible condition at all times.

This fan supplies 200,000 cu.ft. of air per minute against a water gage of one inch, and has a large reserve capacity hitherto not called upon, although the mine workings have been greatly extended since the fan was installed.

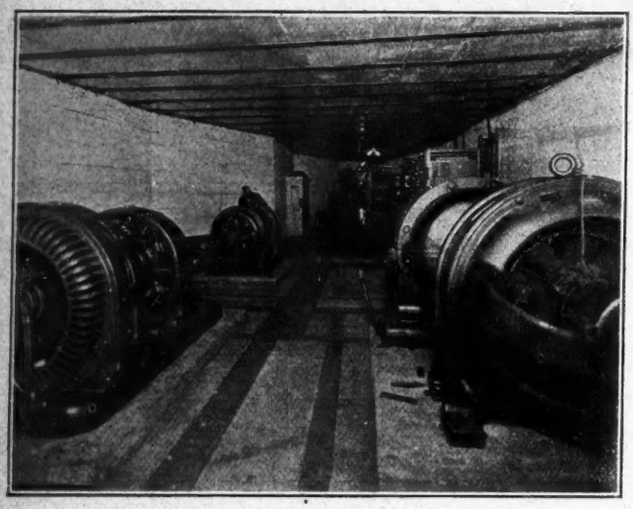
As previously stated, the method of laying out the mine with main entries at 45 deg. from the bottom possesses distinct advantages in securing adequate ventilation. From the mine bottom plan, it will be noted that right angles are avoided wherever possible, so as to decrease the frictional resistance encountered by the air.

The current is split into eight separate parts, giving each quarter of the mine two splits of 25,000 cu.ft. per minute each. The overcasts are carefully constructed and maintained and are of concrete throughout. All doors in the mine are of the two-leaf, center-opening swing type and are opened by the locomotives without stopping, closing automatically after the motor or trip has passed, so that ventilation is interfered with as little as possible by opening and closing the doors. The doors are substantially made, close so as to make a tight joint and have iron reinforcements to protect them from the shock of the locomotives or cars in opening. It is particularly noticeable in this mine that the air is pure and sweet throughout all of the workings and that there is a good current of air passing at all times. As previously stated, the cross-cuts are driven between rooms at intervals of 60 ft., so that the miners at the face are well supplied with air.

All the coal is undercut before shooting by means of continuous cutting mining machines of the Sullivan alternating-current ironclad pattern. These machines



VIEW OF THE COAL PICKING PROCESS



VIEW IN AN UNDERGROUND SUBSTATION

are equipped with 30-hp. motors and cutter bars 7½ ft. in length. Pick-point bits are employed entirely, these being set in blocks, having a range of nine positions in the chains. This arrangement gives excellent satisfaction in cutting this firm, hard coal.

The kerf or undercut made by these machines is 5¾ to 6 in. high and is made in the coal itself, some three or four inches of bottom being left purposely. The machine is sumped at the right hand rib. The take-up rig or rear jack is then set at the right rib and the front jack or anchor is set at the other side of the room. The machine cuts the entire face without being withdrawn from under the coal until the left-hand rib is reached, when it is backed out, remounted on the pan and power car and is ready for moving under its own power to the next working place.

Each mining machine has a certain territory consisting of from 10 to 15 rooms, and a certain number of loaders, from 15 to 20, assigned to it. This arrangement makes it possible to avoid long moves and to have plenty of clean working places ready for the machine to cut, at all times. As high as eight and nine working places have been cut by these machines in a shift's time, under favorable cutting and moving conditions.

These machines develop about 20 hp. while cutting; and when loading, unloading and moving about the mine 4 to 8 hp. is necessary. They take current at around 250 volts, the armatures being wound for 220 volts. The truck is equipped with a reel on which the trailing cable is paid out or wound up, as the machine advances into the room or is withdrawn from it. The mining machine cable is attached to the feed wires in the entries by means of clips as in the case of the direct-current mining machine, except that three wires and three clips are needed.

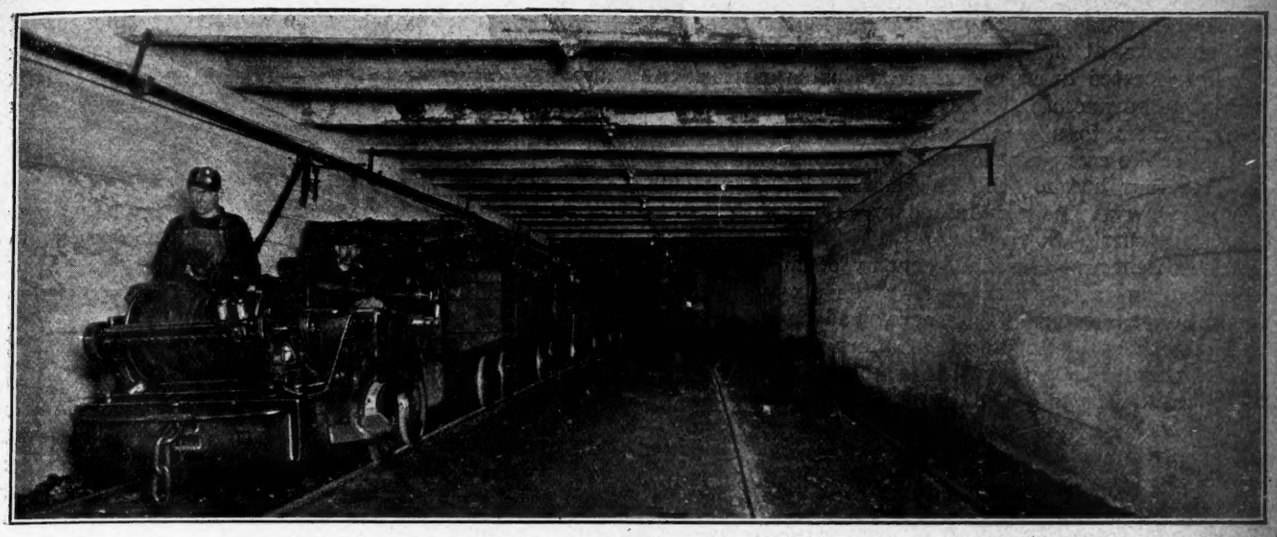
The particular advantage of alternating current mining machines lies in: (1) The greater convenience and economy of employing alternating current; (2) the ability of the alternating-current motors to keep in operation when obstructions are encountered, rather than to stop or stall as sometimes occurs with direct-current machines under difficult cutting conditions.

The motors on these machines are of the squirrel-cage, induction pattern and are quite substantial. No regulating appliances are required on the motor itself and the magnetic leakage of this type is exceedingly low. A high pulling-out torque is secured.

The company has 27 of these machines, and has employed them from the beginning of its operation, not only for work in wide places but also for developing the mine, cutting all entries, cross-cuts and break-throughs. Another advantage secured by the use of alternating current for the mining machine in this mine is that the voltage is always up to the full tension, securing maximum effectiveness in cutting, and handling at all times. The haulage motors are all operated by direct current, so that there is no interference or other demand on the alternating-current line to hamper the proper action of the machines.

In planning the Nokomis mine, the company's engineers considered with the greatest care the question of the character of the power supply and the method and cost of distribution. After securing advice from some of the best known commercial electrical engineers in the country, it was decided to use alternating current as the main basis of supply and, as stated above, to cut

THE UNDERGROUND MACHINE SHOP SHOWING ARRANGEMENT AND MACHINERY



STEEL AND CONCRETE CONSTRUCTION NEAR THE SHAFT BOTTOM

the coal with alternating current and to haul it with direct current.

Power is carried to the mine from the transmission lines of the Central Illinois Public Service Corporation at Kincaid, 27 mi. away, at 33,000 volts. The transformer station, adjacent to the fanhouse and built substantially of concrete and corrugated iron, contains the high-tension transformers which reduce the current for the mine, to 2300 volts, three-phase, 60 cycle. At that tension, the current is carried underground, down the air shaft in lead-covered cables. In the power house at the bottom, already described, a large switchboard is provided for handling the power.

The main supply of current is sent down the air shaft at 2300 volts alternating current to the main panel of the 28-ft. switchboard. Four oil switches on the board divide the 2300-volt line into four districts. Each district is fed by a No. 1 armored cable to a bank of transformers where the voltage is stepped down to 270 volts alternating current for the mining machines.

The main feed cables from the outside transformer station to the mine bottom have a capacity of 100,000 circ. mils on each wire. The low tension, alternating-current wiring is 00 and 0000. The transformers for supplying the mining machines consist of two banks of three 25-kva. and four banks of two 50-kva. transformers, each substation being sufficient to handle five to seven machines.

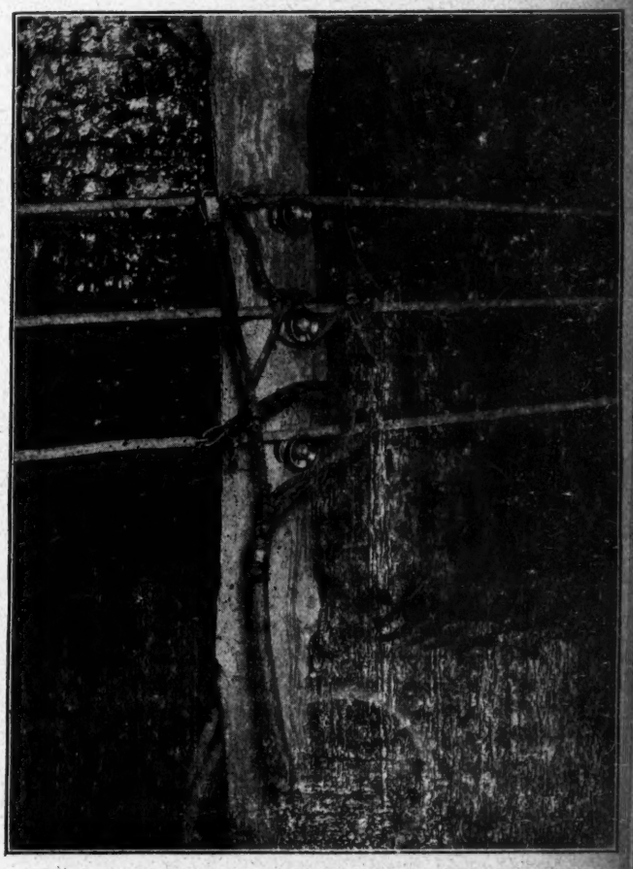
Part of the supply is conducted to motor generators, which convert it to direct current at 250 to 275 volts for the operation of the trolley locomotives.

The switchboard, motor generators and transformers are of the latest type and construction, built by the General Electric Co. The switchboard is equipped with seven watthour meters, giving the monthly consumption per ton of coal hauled to the bottom, gathered by the storage-battery locomotives and cut by the mining machines.

The 0000, fig.-8 trolley wires are carried on steel cross bars along the main entries, close to the roof, where there is no danger that men will come in contact with them. The trolley system is divided into five districts, being controlled at the switchboard by means of automatic reclosing circuit breakers with a direct-current ammeter in connection with each circuit, thus giving the substation attendant control over his road motors.

A motor-generator set is also provided for converting the alternating-current power into direct current for charging the storage-battery locomotives.

At the present time, with the mine developed to a considerable distance from the main bottom, it has become undesirable to carry long lines of low-tension alternating-current wiring to the outer workings for the machines. The 2300-volt current is therefore carried underground along the sides of the entries to points fairly central with the different working sections of the mine and there stepped down by means of transformers



THREE-WIRE ALTERNATING-CURRENT FEED LINES FOR MINING MACHINES, AND METHOD OF CONNECTING TRAILING MACHINE CABLES

to the 270 volts at which it is carried to the machines.

There are, at the present time, six banks of transformers located in crosscuts on the inside entries. As the mine advances, it is merely necessary to move the transformers to a new location and continue the armored cables carrying the 2300-volt current up to them. Twenty-four hundred feet is considered the maximum distance over which the secondary current can be economically carried.

The essential safety and economy of this method of distribution is obvious. During the six years of its operation the company has never had any serious accidents chargeable to the use of alternating current—or direct current either for that matter.

All rock removal, such as taking down roof, lifting bottom, trimming side walls, cutting overcasts or breakthroughs in rock, drilling bolt holes for hangers, and similar work is done by means of Sullivan hand-feed hammer drills, operated by compressed air. Air is supplied by a Sullivan Class WK-2 motor-driven, portable type air compressor mounted on a mine car, complete with receiver, starting panel, etc. This outfit is shown, connected to one of the company's storage-battery locomotives, by which it is hauled about the mine, in one of the accompanying illustrations.

As shown in one of the photographs, the surface buildings of the Nokomis Coal Co. are modern in type and of first-class construction. The tipple is built of steel throughout and loads coal on four railroad tracks. It contains self-dumping cages and shaker screens, also the first pair of raising and lowering booms installed in the State of Illinois for handling coal into cars with the minimum of breakage. These are a valuable aid in picking and sizing the coal. Four scales, 80 ft. long and of 100 tons capacity, are installed, enabling the empty cars to be weighed as they come beneath the tipple and the loads to be weighed on the same scales as they pass out.

The power and hoisting plant is housed in a single brick building, adjacent to the tipple. Steam for the hoists is provided by six 175-hp. Brownell self-contained boilers. The tipple is electrically operated from a transformer substation on the surface. The hoisting engines are direct-connected, having cylinders 28 in. in diameter by 42 in. stroke and operating two 9-ft. steel drums. The engines were manufactured by the Danville Foundry and Machine Co., and the drums by the Litchfield Foundry Company.

The blacksmith shop is one portion of the repair building, which also includes a carpenter and machine shop. There are a separate powder house, oil house and a modern miners' wash and change-house.

A modern and attractive looking brick office building is a recent addition. The mine is supplied with water from eight deep wells, having a capacity of 140,000 gal. per day, discharging into a surface basin or reservoir near the power house.

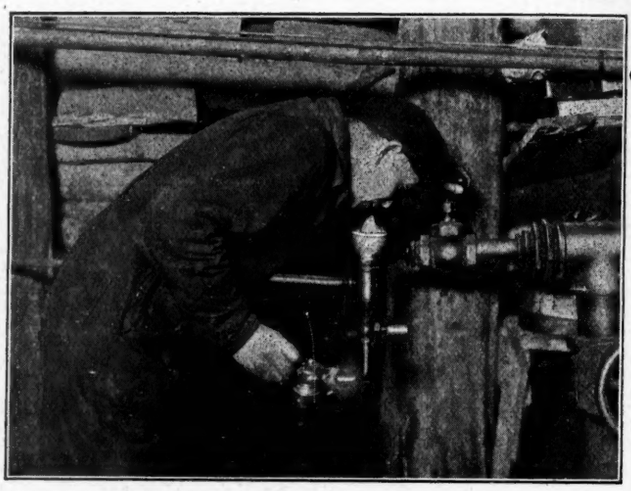
Shipping facilities are afforded by side tracks, connecting with the main line of the C. & E. I. and Big Four railroads and providing for a storage of 140 empty cars and 140 loaded cars. At full capacity, the mine employs from 625 to 725 men, and hoists from 4000 to 5000 tons of coal in 8 hours.

The coal is carefully prepared by removing impurities, by picking and by sizing, into the following sizes—6-in. lump, 1¼-in. lump, 6x3-in. egg, 6x1½-in. egg, 3x1½-in. nut, 1½ or 2-in. screenings and mine run. Coal from the Nokomis mine is marketed under the trademark of Reliance Coal by the Nason Coal Co. of Chicago, with offices in the Old Colony Building. Sales agencies are also maintained in Minneapolis and Omaha. Reliance Coal is widely used for both steam and domestic purposes to the extent of 750,000 to 1,000,000 tons per year.

In securing photographs, and in preparing the foregoing account, the assistance of Albert J. Nason, president; Joseph P. Hebenstreit. superintendent at Nokomis; Edward H. Hebenstreit, mine manager, and Harry C. Hebenstreit, chief electrician is acknowledged.

Drinking Fountain in Mine

To provide good drinking water for men working underground is most desirable. Formerly it was seldom that the men were able to obtain a drink of pure, uncontaminated water underground. In a number of instances in several districts the practice was to catch a small stream of mine water which was trickling over the wall rock, at a convenient place, in some sort of an improvised vessel. Another method was to catch the water in a depression in a rock, from which the men would quench their thirst. The accompanying illustration shows an installation of a drinking fountain in one of the underground workings of the Oliver Iron Mining Co., a subsidiary of the United States Steel Corporation. This illustration has been reproduced from the bulletin of the Bureau of Safety, Sanitation and Welfare of that corporation.



UNDERGROUND DRINKING FOUNTAIN

The advantages of installing such a simple device at numerous places underground over the old system of making no adequate provision for the comfort of the miners is obvious.

The production percentage of each size of anthracite coal during the years 1913 to 1916 was fairly constant. The percentages of the sizes of fresh-mined anthracite produced by the twelve leading producers in 1916 are given in the following table:

	Per Cent.		Per Cent.
Lump	00.3	Pea	12.1
Broken	07.4	Buckwheat	13.7
Egg	12.4	Rice	04.3
Stove	20.8	Barley	02.6
Chestnut	22.7	Boiler	03.4
		Screenings	00.3
Total	63.6	Total	36.4

Need for a Definite Technical Service in the Mining Section of the National Safety Council

Address by Chairman, Mining Section, National Safety Council

By Benjamin F. Tillson
Franklin, N. J.

TO ATTAIN real efficiency in safety work we must *keep our men interested.* This requires persistent effort and ingenuity, for only in this way can we gain their support and maintain their enthusiasm. No single safety engineer can think up enough "stunts" to last 365 days in the year, and the realization of this has drawn those engaged in many different industries into one central coöperative organization—the National Safety Council. Those whose interests lie within the field of one of the most important industrial groups of this country—namely, mining—were desirous of concentrating attention upon their specific problems and at the same time profiting by the broadening influence of the experience of other industries. They therefore formed the mining section as a part of the National Safety Council.

What has this profited us? What are our future needs and how may they best be met?

Good Work of the Safety Council

A résumé of the service rendered in the past by the National Safety Council at large and the mining section in particular should indicate the lines along which an analysis of advance in safety work would show a profit from this association of interests.

The National Safety Council as a whole has provided a weekly service of bulletins suitable for plant bulletin boards, of which about 840 have been devoted to the general topics of safety, welfare and health. In addition there have been issued about 160 mining bulletins dealing with both coal- and metal-mining practices. Even the largest firm represented would not have felt that it could devote the time, money and attention necessary to have produced this bulletin service for direct appeal to its workmen. Only one other section—the electric railway section—can compare in specific sectional bulletin service. It has issued about 20 bulletins more, but the rest of the sections have only from 15 to 75 per cent. of the number which has been received by members of the mining section. However, if interests are so ramified as to make the activities of other particular sections of service, we have at our disposal some 700 additional bulletins issued by nine other sections.

As executives and safety engineers we have further profited by having our attention called each week to the experiences and successes of others in safety work; and this stimulation to our interest and enthusiasm is not only vital but incalculable. It has been accomplished by some 300 "weekly letters" and 15 executive series bulletins, which have come to us without the asking or through any effort on our part. These have also kept us in touch with the times in regard to labor relations, employment problems and welfare work. How else could we have obtained this service?

Some 27 different pamphlets have already been printed to give authoritative information in regard to the safe construction and operation of different elements common to most plants, such as ladders, stairs, boiler rooms, cranes, belts, shafting, engine guarding, oiling devices, knots and slings, floors, scaffolds, grinding wheels, goggles, etc.; while two pamphlets have been produced as being highly pertinent to mining—namely, "Ropes," and "Mine Car Haulage." Only one other section has had a "safe practices" pamphlet prepared for it. In the work of preparing these pamphlets we have had the collaboration of some of the best engineers of the country who are thinking along safety lines. Nowhere else is similar information available.

Finally, we have had the privilege of associating with each other at the annual congress, and we have thus rubbed shoulders, compared notes and argued our mutual problems in safety, health and welfare with men in whose veins flows the virile blood of the present day—men whose duties have brought them in contact with problems similar to ours and whose viewpoints vary from that of the workman to that of the foreman, safety engineer, executive, insurance agent, doctor, teacher, lawyer or other professional man. Not only have we been able to concentrate our discussions upon our peculiar problems by reason of our grouping together as the mining section, but our programs have also been arranged so that we might join in more general discussions with representatives of other industries. Furthermore, we could attend the sessions of other sections (such as the health section) whose interests supplement our own.

Clarifying Discussion of Safety

He who has never attended one of these congresses may wrongly think of it in terms of the occasional engineering or business convention, where there is but little tendency among those present to speak freely and fully of their experiences, and where are read formal, innocuous, boresome papers written in so historical a style as to produce no discussion and questions from the floor elicit no satisfactory replies. If such an impression exists, it may readily be refuted to the satisfaction of even a stranger to the meeting of the mining section, for the extensive printed transactions record that over one-third of the information presented during the last three congresses was developed in discussion.

Perhaps the "Round Table" is a new idea to some of us. If so, it must be experienced to be appreciated, unless we think in terms of those exciting conferences we have held with our confréres, at which we have participated in informal discussions of ways and means for accomplishing some object of mutual interest and have defended our views and "hobbies." A round-table session in similar, "only more so," for the chairman with watch in hand is forced to limit an individual's remarks to three minutes in order to give an equal opportunity to all—and his gavel may fall in the midst of our "one last thought."

Such a session is provocative of clear, concise thinking and produces that nervous tension so necessary to stimulate the enthusiasm that makes us cling tenaciously to our ideal plans and smooths the rough drudgery necessary for their consummation. These round-table sessions are held not only as a part of the mining section meetings, but also of the general meetings of the National Safety Council. And we all enjoy the privilege of profiting by the experience of others and gratifying our own modesty by proclaiming our successes or seeking solutions for our unsolved problems.

However, if business or other conditions prevent our attendance at the annual congress we still may profit by its *Proceedings*. Nowhere else is there so encylopedic a source of authoritative information regarding the problems of safety, health and welfare as is presented in the published proceedings of the National Safety Council since its inception in 1912. These comprise over 5800 pages, 6 x 9 in. in size, of which about 680 pages are devoted particularly to the mining industry.

Perhaps the summation of the last three years' proceedings is most indicative of the amount of information now annually being made available for reference. The total for these years was about 4200 pages, of which 550 pages were the proceedings of the mining section. It should furthermore be borne in mind that this literature is the coöperative effort of individuals, as well as of those who represent both large and small industrial organizations, Federal and state agencies and engineering and other societies.

This is an Age of Specialists

Perhaps it has not been amiss to thus enumerate the activities of the National Safety Council and its mining section, for its benefits are dispensed so continuously that we may have come to receive them thoughtlessly and so have lost the perspective which is given us when we ponder upon the subject as a whole; and we should not fail to add as a benefit the opportunity which exists at all times to present our special problem to the competent engineering and executive staff of safety specialists at National Safety Council headquarters, which has at its convenience an exhaustive library and file of information and which stands ready to share it with us. So much for what we have (or should have) received if we had sought it.

Our work and our life is yearly becoming more technical, and general information must be supplemented with specific knowledge in order that it may be applied *practically*. We are living in an era when specialists are a necessity, and we all require the services of a mining safety engineer if we intend to make any considerable progress in the reduction of accidents. Compensation laws, insurance ratings and general safety propaganda have made it plain to us that safety pays, both for employer and employee. Both, however, are prone to forgetfulness in this matter and require continual reminders.

With some concerns the size of their operations makes an extensive safety organization feasible, and they may therefore feel that they can "go it alone," since circumstances would compel them to give more to such an organization as the National Safety Council than they would receive in return. It would be wise for them, however, before deciding on such a course, to consider several things: Are not their safety engineers so tied down to plant details that they find it difficult to get away and obtain entry to other plants for the observation of problems and solutions of others?

Need for Proper Coördination

And would not many of these other plants be so remote that these engineers could not spare sufficient time or money to visit them? Does not the continual educational campaign which it is necessary to prosecute for the workmen's benefit whether by bulletins, lectures, courses of study or moving pictures, require resources outside of those available in the operations of any one company, in order that the reiteration of advised safe practices may be made attractive by their novelty of presentation? Does not the giving out of information devoid of trade secrets pay both by reason of our analysis and more thorough understanding of that which we desire to make clear to others, and also because our generosity begets a similar attitude in others and we receive much value from the coöperative effort produced? If so, no company is too large to receive adequate benefit from the coöperative support of a skilled technical man who could put at their disposal, in proper shape for use, the information, bulletins, etc., which he has gleaned from others, and who also makes it possible for them to reciprocate with the least effort.

Let the "doubting Thomas" try but one experiment—namely, to plan a program for 100 meetings of his safety committees which will so hold the interest of his men as to induce them to attend without pay and which will also show value in accident reduction. Such an attempt will destroy any feeling of self-sufficiency and indicate that his safety engineer (who may be responsible for many more such meetings) deserves all of the outside aid that he can obtain, and that the efficiency of his plants is well worthy of such help. Remember, we are considering definite technical services, for general information might here be an entirely different story.

On the other hand, there are thousands of small plants that cannot see how their operations could stand the expenses of a man who would devote all his time to safety work. With some the safety spirit may be present and with others lacking. The former may not require the general information, but they both will need specific help not only in regard to the proper practices in design and operation to overcome their hazards, but also with respect to prepared educational matter for inaugurating and maintaining a safety campaign.

Even more for these small companies than the larger and wealthier ones is it imperative that they receive the intensive technical service which will show immediate marked results in accident abatement and correspondingly lower costs in production and insurance ratings; for they cannot afford to make a "long swing" investment in safety on faith in the ultimate profit,

since their resources might be dissipated before the time came for reaping the benefits.

Most of us desire to respond generously to appeals from others as to how they can better conserve human life and effort, but the urgency of our duties and pleasures almightily interferes with our preparation of complete and technical descriptions and illustrations of the methods we have used and the results we have produced. No, it is not because of a lack of willingness that we have not helped each other more in the safety movement; it is because of the lack of a suitable agency. Writing or dictation is laborious because it requires the logical correlation of our ideas with much data which are not carried in the memory, and because it is performed in an office or home environment where we cannot reap the benefit of contact with physical conditions that stimulate our recollections through the association of ideas.

What a Trained Safety Engineer Will See

For example, if a trained safety engineer should visit us, look around the plant and consult our records and drawings, he would acquire a vastly greater fund of information from our casual and disconnected conversation as elicited by his inquiries, or our observations (if we should happen to personally show him about), than we would probably ever attempt to write down even though we did take time from our other activities with the intent of presenting the subject in the form of a letter or address. Why? Because he would make it his business to do this one thing and this only, while we could not avoid the distractions of other duties. Also, we would have become so familiar with many of our old practices that we would not appreciate the novelty and interest they might be to others. Thus we would neglect to mention them unless they were called to our attention by a stranger.

Is it not clear that if no other purpose were accomplished than the sending around of a capable man to various mining properties, to dig out information for its managers and for others as to what is being done to enhance safety conditions, it would warrant a considerable expenditure by each of us?

When can we expect the greatest potential returns from our membership in the mining section? Is it not when we have every mine in the country as an ardent supporter? Then let us increase the value of membership through the service we render to such a degree that no company will fail to realize that it cannot afford to neglect the opportunity to join our ranks.

Will not a keen and technical executive secretary, through visits to various mining camps and his personal contact with representatives of various mining companies, give us greater and more valuable publicity than could be effected in any other way? Should not his conversation and presence be more effective than any solicitation by correspondence? If so, then the benefits accruing from increased and more representative membership would warrant our making an additional investment for such a worthy object.

We are in an era of diverse and profuse legislation. It seems as if almost everyone else knows more about how we should conduct our affairs than we do ourselves; and they desire to make us follow their beliefs and fancies. Foolish as this may sound, it seems to be a reality; and if by chance we do not know how to conduct our business with the greatest economy in material and human factors, we should make haste to learn if we would hope to survive industrially. If we do know these things, we should so formulate our practices as to plainly demonstrate that fact. Otherwise we may suffer from ignorant or mischievous legislation.

The principal ingredient for a cure of either dilemma is a complete code of safety standards in respect to mining. The apparent object of most of the mine laws and regulations upon the statute books of various states is the protection of the lives and unimpaired health of the workmen as well as the interests of the public at large. The mining section has the same objects in view, but what are we accomplishing in that direction? True, we are originating and assembling much valuable information and recommendations, but are we doing it in a systematic, painstaking and final manner—let us be honest and properly say technical manner? No, we are not doing this as we should. Then what is wrong?

It seems astonishing that a chairman of a section should so flaunt his incompetency if he truly is responsible for this state of affairs. Generously grant that the chairman and his executive associates have not failed in the duties imposed upon them. Rather consider the organization as a whole in order to see whether anything else might be responsible for this deficiency. Examination will disclose a section more highly organized than any other of the National Safety Council. Its officers and committeemen well represent the different phases of the mining industry, both geographically and industrially. An extensive organization of committees will be noted—executive, membership and publicity, standardization, accident statistics, ropes and safety devices in hoisting and haulage, mine hygiene and sanitation, mine fire prevention and fighting, mine rescue and first aid contests, program and publication. It will also be found that the functions and activities of these committees have been thoroughly outlined and correlated. Then what is lacking?

Need for Something More Than Committees

Naturally and properly the members of these committees are widely separated geographically and are men of affairs with absorbing business interests. If their time were not of considerable value to their industries, their opinions would not be worth much to the mining section or to any participating member. Such time as they can devote to the interest of the mining section should be utilized with the greatest economy, and this would be accomplished by relieving them of all routine labor.

This is no more than your company's practice toward its executives. Would you not feel more tempted to serve in their places if you knew that your knowledge and ability would be drawn upon in an advisory capacity without your being expected to steal extra time for petty details and drudgery? That situation can be met only by the employment of an executive secretary for the mining section, who will make it his business to reduce the amount of correspondence between officers and committeemen and prepare inquiries in such a form as to permit each man's knowledge and experience to be available with the least expenditure of time and effort on his part.

Such an official would outline the general features of "safe practices" pamphlets, which would ultimately become a code of standards. He would utilize the various committees in an advisory capacity to fill in the essential details which could be obtained in no other way

than from the store of their varied experiences; and the seal of approval of such advisory committeemen would be a respected guarantee of the recommendations made.

This is the reason why we have not achieved more in these essentials—because we had no funds with which to pay for the services of such a technical executive secretary.

Other expenses would also naturally be involved in the production of such safe practices pamphlets or standards. From time to time the settlement of a question will involve research work, and while this probably could be "farmed out" to some industry whose interests would parallel our own, yet we should be in a position to assume any contingent expenses or, in some cases, all of the expenses. A technical man as secretary would also be required in the follow-up of such work.

The profession of mining is an extremely broad one, since it requires knowledge not only in the specific field of mining engineering but also in other similar or allied fields such as mechanical, electrical, civil and sanitary engineering. The problems of safety, health and welfare in mining require coördination with the activities in these other branches of the engineering field. In the national engineering societies representing all of these branches considerable attention is naturally devoted to the same or kindred subjects which come before us in the mining section of the National Safety Council, and standards committees in these other societies will consider standards to meet the needs that we also will strive to meet. It is therefore highly important that there should be close coöperation between all of these agencies; and to be efficient, this service should be performed by one who is devoting all his time to the activities of the mining section. Again we find need for a technical executive secretary.

Our present foremen and miners, as well as the present and coming generation of mining engineers, need definite and concrete courses of instruction in the "hows" and "whys" of safe mining practices. But how are they going to get this information? There are no schools and colleges prepared to teach it, nor are there books in which they can find a thorough and able presentation of the subject. Must they all learn in the rough and expensive school of experience, or will we aid them by preparing courses of instruction which may be used in the schools and by the classes formed at our plants?

If we pursue this latter course, we will be engaging in a task which we can never hope to complete properly through the sole agency of volunteered services. We must be prepared to pay for the outlining, editing, writing and publication of such a work and wait for our returns from its sale and use. Again we find a need for definite paid technical service.

To me the reasons for this need seem legion, and if the few I have presented do not demonstrate the fact incontrovertibly it would be useless to attempt further to demonstrate a theorem that seems axiomatic. I will therefore rest my case with the observation that no engineering society of prominence, including the National Safety Council, attempts to operate without a paid, technical executive secretary. When we consider that the wealth involved in the mining industry runs well into billions of dollars, and that the men engaged in that industry number millions, it appears that the mining section of the National Safety Council has been given heavy responsibilities in assuming a prominent position in the promotion of safety, health and welfare measures. Are we going to meet our obligations? If so, we must render more and more service. And in order to be true service it must be technical.

How can we finance the demands made by a more technical service? The answer is extremely simple—by increasing the dues of mining members. We might well call the increase a surtax, if that term has not achieved unpopularity because of its association with our income taxes.

For the conservative growth represented by the engagement of an experienced mining and safety engineer as our technical and executive secretary, in the mining section, and for his traveling, and other expenses incidental to his work and that of the volunteering officers and committeemen, we will need an additional yearly income of about $10,000. The necessary office and clerical assistance might properly be expected from the National Safety Council headquarters, with the same bulletin, printing and other service that we have been receiving in return for the regular dues which we are now paying. Although the mining and the metals sections stand on a par as the two largest sections of the National Safety Council, yet the membership and dues for each amounts to only 7 or 8 per cent. of the whole. The membership of these two on Aug. 1, 1919, was 253, of which 165 were coal-mining and 88 metal-mining companies. They paid, in dues, respectively $6,532.50 and $3,877.50, or a total of $10,410. The highest amount paid by any one company was $157.50 per year; the average was $41. Of course, more than half of the membership pays less than this average.

In view of the fact that the maximum amount involved for any one company seems slight compared with the benefits which should accrue, and that the average amount involved for each company is small, I strongly urge the members of the mining section to increase their dues to double those they are now paying, with the understanding that the excess above their present dues be devoted to the specific activities of the mining section.

I trust that there will be a free expression of opinion as to the need and advisability of this step, and an authoritative communication from the various individuals and companies who are members as to whether they would approve and support such an action.

In case of fire or an explosion at a mine a messenger should be sent or a telephone should be used to call the assistance of persons at points distant from the mine. The character of the aid needed is of much importance; men who are experienced in mining and who have had training or experience in mine-rescue or mine-recovery work being most needed. The following persons should always be notified promptly; State mine inspectors and the coroner of the county in which the mine is situated; the local mine-rescue station, and any trained crews of rescue men; the United States Bureau of Mines rescue car or station nearest the mine; and the surgeons and doctors in the vicinity of the mine. To facilitate calling assistance, there should be kept posted near the telephone stations at the mine and office the names and addresses of all of the officials mentioned, so that they may be reached without delay.—*Rescue and Recovery Operations in Mines.*

Recent Development in Mine-Rescue Apparatus in the United States

By F. F. Morris
Wilkinsburg, Penn.

THE first equipments of self-contained mine-rescue apparatus were introduced into the United States late in 1907 and were used by the Anaconda Copper Mining Co. in fighting a mine fire. The apparatus installed was of the Draeger model, with metal helmet and twin oxygen cylinders, also twin air regenerators and double breathing bag directly connected to the helmet. Up to the time that the great European War broke out in August, 1914, or within a period of about seven years, the use of self-contained breathing apparatus for fighting mine fires and accomplishing rescue work after explosions had become so general that no less than 8000 units of such apparatus of different types had been installed in the United States for mining work, to say nothing of a large number being used for industrial purposes, in chemical plants, around blast furnaces, in ammonia plants and in numerous other industries.

Self-contained breathing apparatus was introduced into the United States in the year 1907. Up until the breaking out of the European War all such equipment was imported from foreign countries. Fostered by a strong demand and cut off from outside supply by the war, the growth of American apparatus has been rapid. The use of breathing equipment is certain to increase as mines grow older and deeper.

It has been through the instrumentality of the U. S. Bureau of Mines that interest has developed in the use of self-contained breathing apparatus. This organization today has been perfected to a point where its mine-rescue stations and mine-rescue cars located at various important mining centers throughout the country are not only themselves doing great work in actually assisting in mine-rescue operations, but are creating a sentiment in favor of the use of such equipments by the producing companies themselves and encouraging the installation of mine-rescue apparatus by private enterprises.

One of the most important considerations in the use of breathing apparatus of this kind is that it is highly essential that apparatus be put into service promptly at the time of a mine explosion, or in the event of a mine fire, if lives are to be saved and property adequately protected.

In January, 1917, the Bureau of Mines issued Technical Paper No. 82, the subject of which was "Oxygen Mine Rescue Apparatus and Physiological Effects on Users." The authors were Dr. Yandell Henderson and James W. Paul.

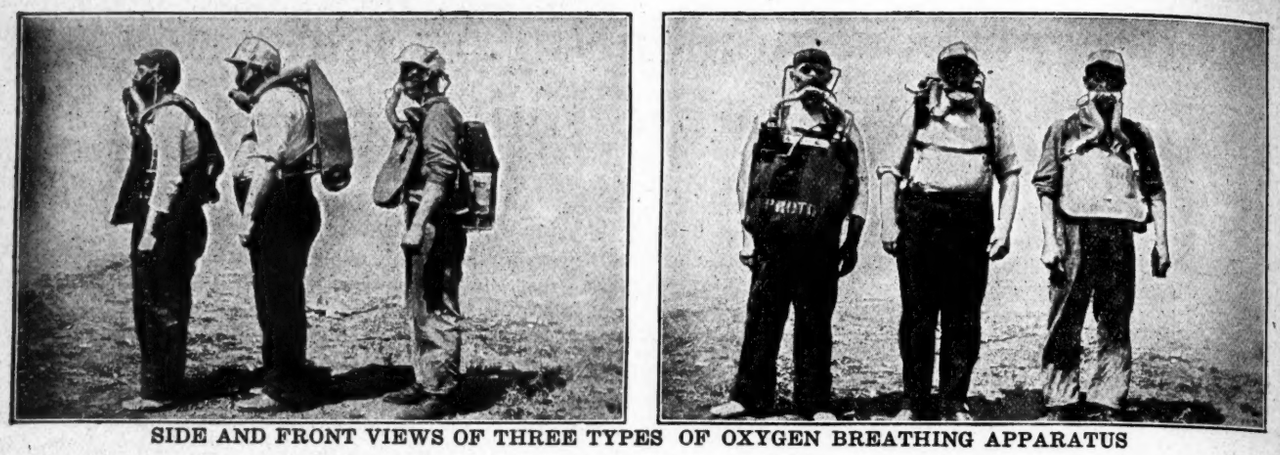
Quoting from the preface by Mr. Manning, "the report had three purposes, first among which was to show the inherent limitations of present types of oxygen breathing apparatus and to indicate improvements in design that will more nearly meet the requirements of use in poisonous or irrespirable gases." Mr. Manning further states in his preface that "during seven years, until January, 1916, Mr. Paul was in charge of the mine-rescue operations, the testing of the various types of apparatus and the selection, for the equipment of the rescue operations of the Bureau of Mines, of those types shown to be best suited for rescue work. His experience has included the supervision of many mine-rescue contests in which the apparatus was worn, as well as the personal direction of many actual rescue operations following mine disasters. Thus he has been enabled to discover in actual practice the defects as well as the merits of the various types of apparatus."

Quoting further from Mr. Manning's preface, "During the past two years W. E. Gibbs, an experienced mechanical engineer, has been at work for the Bureau on this problem. Mr. Gibbs, aided by the advice and coöperation of the authors of this report, has produced an apparatus which, in experimental tests, has shown itself superior to the older types, but which has still to be subjected to further tests in service."

After completing his work with the Bureau and assisting in the development of the Gibbs apparatus, Mr. Paul, with his unusual fund of experience and knowledge of the subject gained through the advantageous circumstances which had surrounded his connection with the Bureau of Mines, undertook the task of introducing features into rescue apparatus which have to do with the efficiency and safety of the machines in operation, and which had not before been incorporated in any form of apparatus. The problem, however, was to develop such an apparatus with the additional features of efficiency and safety, without, at the same time, complicating the mechanism.

Chief among the recommendations for improvements in rescue apparatus was one for a self-adjusting oxygen feed valve to replace the fixed feed valve then used. Mr. Paul has developed the self-adjusting feed valve, which as designed by the manufacturers has a much more simple and safe construction than was provided in the former fixed-feed valves.

It was further recommended by the autnors of Technical Paper No. 82 that an artificial form of circulation should be replaced by a natural circulation, that the absorption of the carbon dioxide should be so nearly complete that the air in the circulation system during moderate exercise will not contain more than ½ per cent. of carbon dioxide, and at no time, even during the most vigorous exercise, more than 1 per cent.; that a bypass valve should be made a part of the apparatus, this to be used in case of failure of the reducing valve; that the inhalation and exhalation bag should have a combined capacity of at least 8 liters; that the air within the circulating system should at all points be under a positive pressure; that all tubes and valves should be sufficiently large to permit the breathing of 100 liters of air per minute; that an efficient radiating and cooling device be provided. All of these features have been in their entirety incorporated in the Paul breathing apparatus.



SIDE AND FRONT VIEWS OF THREE TYPES OF OXYGEN BREATHING APPARATUS

A number of state mining departments and a large number of the private mine operators throughout the country have thoroughly investigated the Paul apparatus and adopted its use, in many instances replacing older forms of equipment with this latest development.

The deeper the mine entries extend into the earth, the more dangerous become the operations. Mines in the United States are, as compared with those in Europe and Great Britain, very young. The need for rescue apparatus has for this reason been felt years prior to its adoption in the United States by those operating mines in European countries. The use, however, of such equipments is certain to increase as the mine entries are extended farther away from the surface of the earth, and the development of the industry in the United States through the excellent coöperation of the Bureau of Mines has taken such strides during the past 5 years that it is on an established footing now, whereas prior to the war it was necessary to import all such equipment from factories in Europe.

State mining laws are being made more rigid with a view to conserving life and property, and among other provisions in many of the statistics now in existence is one to the effect that insurance premiums are reduced if rescue apparatus is installed and kept ready for service. Most of the mining companies, however, do not require this incentive to interest them in the installation of such equipments, as they readily realize the great advantage to them in protecting the lives of their employees and assuring prompt and efficient action in saving property in the event of a mine fire starting.

The industry which has thus been developed through the period of the war is destined to be one of the important branches of the safety movement in the United States.

Some Savings Possible at Mine Power Plants

Little thought is ordinarily given to the consumption of coal at the mines, and unless this subject is frequently brought to the attention of the company officials no attempt on the part of the men who have charge of the equipment will be made to improve the boilers, methods of firing, distribution of steam, or the use of steam in either pumps or engines.

A great saving can usually be effected by a close examination of the boilers. This may be conducted somewhat as follows: The brickwork should be tight—that is, should have no air leaks. If return tabular boilers are employed, there should be ample distance between the shell of the boiler and the grate. The fire-doors should fit tight and be provided with liners to keep them from warping. The conbustion door (entrance to combustion chamber) should also fit tight, as well as the smoke-box doors. When blowing back, the safety valves may waste steam; this should be rectified. As high a steam pressure as the equipment will permit should be used. Most important of all, the boilers should be thoroughly cleaned.

Where the life of the plant will justify it, it will usually effect a saving of 25 per cent. in fuel if the boiler settings are rebuilt from the foundation up; In some instances a saving of 50 per cent. will be realized in addition to rebuilding the settings the firemen be systematically instructed as to the reason for this thing and that, and of the advantages of a maximum steam pressure, high furnace temperature, etc.

A few instances where a great saving of fuel has been effected; might be given. In one plant where there were seven large boilers, and six of them were on the line at all times, the firemen cleaned their own boilers. They were relieved of this work, which usually had to be done on Sunday, four of the boilers were rebuilt, their blow-off valves ground and fitted tight, safety valves ground and the blow-back adjusted, columns repiped and other boiler details set right. This plant then operated on two boilers, and even after considerable equipment had been added it was able to operate during the war on four boilers.

Another plant was using four boilers. After about the same procedure as detailed above, it was able to operate on two boilers. And to this day it would take some strong talk to induce the firemen to put on more than two boilers, since they know that in that case there would be more coal to shovel and more ashes to wheel, resulting, of course, in more work for them.

Along with the boiler improvement goes proper construction of the feed line, proper adjustment of the feed pump, adequate deadmen for the stack guys, care of the boiler house and the proper kind of wash room, as well as other improvements and facilities making for the efficient consumption of fuel and good conditions for the workmen.

Mining of coal at the Eska mine of the Alaskan Engineering Commission is beginning to assume proportions which make it very helpful to the Commission. During March, which is the last month for which a report has been received by the Secretary of the Interior, the production was 3690 tons. Ninety men are employed, but a number of them are on non-productive development work.

Fire Prevention in Anthracite Coal Mines*

Necessary Equipment for the Extinguishment of Mine Fires

BY M. W. PRICE
Jeddo, Penn.

PREVENTION of fires, the necessary fire-fighting equipment and the extinguishing of mine fires is a subject which has, on account of the various conditions under which they occur and the hazardous work connected with them, together with the possible loss of life and destruction to property involved, furnished a topic for discussion among mining men that is not surpassed by any other subject related to mining.

The prevention of mine fires necessitates a careful and frequent examination of some sections in anthracite mines because of physical conditions over which no control can be had. The elimination of wooden structures in the mines has been the means of preventing numerous fires and permits of more time and thought being expended in trying to prevent fires in sections necessarily heavily timbered, and in portions of the mine where the "robbing of pillars" is being done. Workmen engaged in timbering should not be permitted to use the common oil lamp on account of sparks and the careless manner in which old wick (cotton) is thrown around when it becomes necessary to put a new wick in the lamp. The careless manner in which oil is used in lamps in many cases causes timber to become saturated and is the means of causing disastrous fires. Again, I have seen night patrolmen making their examinations and using the common oil lamp. This seems a grave mistake. Such a watchman should be furnished with an improved electric lamp and also have a safety lamp of modern type. Thus equipped, he will be prepared to perform his duties in a proper manner.

The robbing of pillars, especially in the Mammoth bed, on account of its great thickness and by its continuous crushing, generates a heat that causes everything to become so dry that a disastrous fire may develop in a short time. Added to this risk is the possibility of encountering methane while driving up chutes in the pillars. I have seen careless workmen engaged in timbering in sections where the fire risk is great add to that risk by permitting a trolley wire to touch the timber instead of making the wire hangers properly support it. In sections of this nature a water line on the gangway with branch connections arranged about 200 ft. apart with a 50-ft. section of fire hose placed at each branch will enable a person discovering a fire to apply water to it in an extremely short time. This system of "fire lines," as it is called, will be of vital importance to the patrolman by night who, without it, upon discovering a fire, is forced by lack of system to travel a considerable distance for equipment and help.

Various methods have been advocated for extinguishing mine fires, because of the good results that each has obtained. These include flooding or smothering the sections affected, depending upon conditions. Numerous discussions also have taken place describing in detail the methods used at various fires, while the results have been carefully noted. Little has been mentioned concerning having men properly organized for this particular kind of work. The results of poor organization have been demonstrated where the work at small mine fires, improperly directed in the beginning, has been the cause of a large disaster eventually.

In fighting mine fires much depends upon speed of action and proficiency of organization. No two mine fires are alike and nothing even approximating set rules of procedure can therefore be laid down. It is always well to keep on hand sufficient supplies of pipe fittings and other equipment so that a mine fire may be extinguished before it reaches sizable proportions.

The importance of the mine foreman in some instances is not properly realized or appreciated. His thorough knowledge of the mine, for instance, the circulation of air and the quickest way and most convenient place in which a current can be changed so as to bring about desired results, together with the exact conditions of each working place, whether or not it happens to be one which is giving off gas or a place with a dangerous roof, makes him the most valuable man available. The delay which will be caused by an accident happening to the foreman at a time of this kind does not seem to be realized.

Notwithstanding all of this, invariably the foreman is the one man who can always be found in the most dangerous place. Then, again, it is no uncommon sight to see the superintendent in the most dangerous place. I fully realize the anxiety which is caused by a mine fire, but nevertheless I maintain that the proper place for the directing head is back from the scene of the fire a safe distance where he can properly think and direct the work, for there is nothing which spells disaster at a time of this kind like the loss of proper control.

The extinguishing of a mine fire today in the older mines of the anthracite region requires keen thought and especially prompt action. The virgin mining being finished and the reclaim or pillar robbing being done rapidly, prevents the most efficient of mining men from having complete control of the air currents. Air is a predominating factor in performing work at a mine fire. It can therefore be readily understood that the conditions in a mine govern the method that can be used to the best advantage.

I have had the opportunity of assisting in the work of extinguishing quite a number of mine fires (some of which were of an exceptionally serious nature), and have seen various methods used with good results. Owing to pillar robbing, causing in some places the strata to be crushed and broken, it becomes a difficult proposition to flood or smother a fire in some sections without seriously affecting several others. This is quite different from what was to be expected in former years, in the anthracite region.

In beds where the coal is of a soft and shelly nature and fire occurs, which causes caves to develop, thus preventing direct work, good results have been obtained by taking a piece of 2 or 2½-in. wrought iron pipe and clos-

*Paper presented before the eighth annual safety congress of the National Safety Council, Cleveland, Ohio, Oct. 1 to 4, 11

ing one end in the form of a pick point after which the pipe is drilled with ⅜-in. holes in a spiral manner throughout its entire length, the holes being spaced reasonably close together. The pipe is then forced through the caved or loose ground, after which a hose is attached to the open end. In this manner water may be forced onto the fire, thereby extinguishing considerable of it and making the caved material cool enough not to interfere with the process of loading it into cars. This spray method can also be used in some instances in and around burning timber to good advantage.

Boreholes are sometimes drilled for the purpose of running water down onto fires, and while this will be the means of extinguishing some fires, still it does not accomplish any remarkable results because of the fact that the water takes a natural course, and since it is not possible to increase the original supply through the hole the results are not what is expected.

Good results were obtained at one large fire, which had burned up into a caved section where pillar robbing had been done, by placing on the surface a large tank which had a capacity of about 60,000 gal. Two large mine pumps discharged into this tank, and when this was filled the gate was opened by a mine locomotive pulling on a tackle which had been properly arranged. This large quantity of water was run into the caves and the measures being all thoroughly broken permitted the water to pass down over the fire. In this manner a large portion of the fire was extinguished which, on account of the caved conditions, would have been extremely difficult to reach from the inside.

Mechanical devices, such as mine-rescue apparatus, permit men now to penetrate fire zones and accomplish such work as the laying of water lines from which hose can be used and the using of fire extinguishers direct on the fire, also the building of air brattice to establish necessary ventilation as well as doing various other kinds of work. Thus direct fire fighting may now be performed, which seems to be the right procedure in that the official in charge is in a position to note the progress and changes that are constantly taking place at a mine fire.

This brings out the importance of mine-rescue equipment and the vital necessity for the proper training of men in its use in that the work performed by a corps of men well trained in the use of the apparatus at the beginning of a fire will prevent both possible loss of life and great destruction of property.

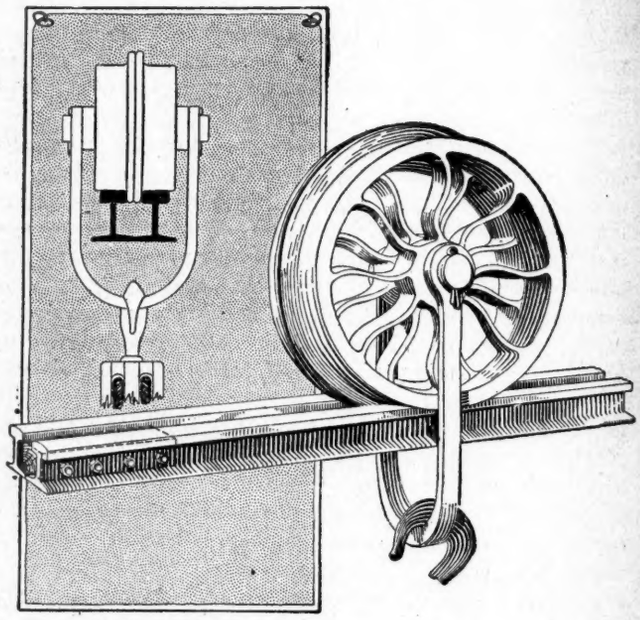
The establishment of a fire-fighting equipment to consist of fittings, pipe, hose, nails, brattice cloth, boards, tools, telephone and a fire pump, which should be kept intact at all times, is a valuable asset to any mining property. Again quite often steam and air lines, coming from the surface into the mine, can be converted into water lines in a short time. Conditions of this kind may be taken advantage of and by their aid a supply of water quickly secured. This more than once has been the means of preventing what might have developed into disastrous fires. Available lines of this description are sometimes overlooked in the excitement caused by a fire and through lack of a proper organization.

In conclusion, I would say that the fire-fighting organization should be such that when a mine fire does occur each man will fully understand his duties. This prevents dangerous delays at the beginning of a fire in making up an organization.

Monorail for a Chain Block

Where chain blocks are used for various purposes in and about the mines it is sometimes advantageous to ssupend them from some kind of a track or traveler so that the weight handled may not only be lifted but moved a certain distance. The Pittsburgh Coal Co., at its Crescent mine, has in use a homemade traveler that although simple in construction well answers the purpose for which it was built.

Two track rails are placed side by side with the space between the balls of the rails just wide enough to permit the flanges of two car wheels placed back to back to fit the roll easily between them. A piece of strap iron bent in a U-shape passes around the bottom of the



rails and extends upward far enough so that a shaft or axle passing through the wheels also passes through the extremities of the U. Spacers between the wheels and the sides of the U-shaped yoke and lynch pins or cotters through the axle at either end complete the outfit.

If ordinary lengths of rail are too short to serve the purpose in hand two lengths may be joined with fish plates. If the strength of the traveler track thus formed is deficient the track may be reinforced either by one or two other rails placed bottom up under the first two, or a wooden or steel beam may be similarly placed. Several variations of this general plan may be worked out as occasion or expedient may dictate. In any case the device will be simple and if properly constructed it will be fairly efficient.

THE CONSERVATION OF FUEL is a vital problem the world over, and among the pertinent suggestions looking to this end are the development of water-power and the electric transmission of such energy. The problems of water-power development are the same in all countries with varying local conditions, says Past-president Main of the American Society of Mechanical Engineers. As the requirements of business grow more exacting, it becomes absolutely necessary to have constant power assured. A specific instance of this necessity could be cited in connection with the wonderful electrical development in southern West Virginia to supply the rapidly expanding coal-mining industry of this section.

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The Radical Foreigner.

MUCH of the blame for the present industrial unrest in the United States is laid at the door of foreigners—alien labor—men who have never accepted Americanism in its entirety. Prosecuted in the country of their origin, kept in subjugation and ignorance by despotic governments, permitted no religious or political independence, the men who in past years came to our shores did so because they sought a haven, a refuge, an asylum wherein they could achieve those things the accomplishment of which had been denied them.

And when they landed, many of these immigrants harbored within them only a feeling of hatred toward the country they had left. America was a land of opportunity—the Promised Land. At home, the foreigner had heard many tales of the new country. Human nature being so constituted, those of his countrymen who had preceded him, and who had fared not so well as they expected, would write glowing accounts of a land literally flowing with milk and honey; for who would have the courage to admit that he was a failure in a country where so many others had succeeded! So immigrant followed immigrant, singly and in groups, large families and small families, all with expectant faces and hearts that were filled with new ideals. For this country was a Democracy, a great and glorious place where opportunity was written in large letters and where success depended on initiative and personal endeavor. But alas, our foreigner had no more than landed when we, who prided ourselves on our Americanism, who were only one or perhaps two generations removed from him in circumstance, began to strip him one by one of the ideals he had carefully cherished, of the radiant visions he had beheld in his day-dreamings on the voyage over. Having come from a land where intolerance and injustice had left their impression on his mind and a crimson tint on his thoughts, he found similar conditions awaiting him here. Don't let us argue about this fact, for this is but the least of the ills that we have worked on the foreigner. We have asked him to assimilate American customs and ways of doing things, and then we have ridiculed him to his face while he was trying to do so. We have told him that he was necessary to the welfare of this country, and then we have taken advantage of his ignorance to exploit him. We promised him a land of freedom and largeness of opportunity, and when he came we shunned and ostracized him.

Ignorant? Of course he was ignorant. Crude, uncouth, and even filthy? Yes, he was these too. But it was not long after he came that he discovered that learning and education were to be obtained for the asking. And it was then that we Americans, those who have the real well-being of this country at heart, missed a grand opportunity. Instead of showing him our other side, the side that he thought extended all the way around when he was forming his plans to come to us, we let him learn from those of his countrymen who had become sophisticated here, from those who were only too ready to fan into flame the embers of hate against constituted government that lay dormant within his heart, and to use this hate to their own advantage. We did not trouble to teach him and tell him the truth about ourselves. We did not trouble to show him the real America. No! It is only of recent years that we have agitated for a real Americanization program, for an educational plan that will help the foreigner realize his ideals.

We are a nation yet young, therefore we have made and will make mistakes. But the one mistake we must not continue to make is that of treating the foreigner as we have treated him in years gone by. If we would have him become one of us—in thought and in action—we must make him one of us. We must indicate to him the mistakes he makes, in a kindly way. We must educate him, and bear with him while he is learning.

If America is at the present time overrun with rampant, radical foreigners, we ourselves are in no small measure to blame. Instead of smothering the fire when we could have done so easily, we permitted it to smolder. No fire will continue to burn unless it has something to consume. Have we, wittingly or unwittingly, been furnishing the fuel?

How About Development?

OF all the radical schemes, plans, systems, etc., that have so far been propounded for the "democratization of industry," for the pacification of labor militant, for the amelioration of "social unrest," not one has made provision for industrial expansion. Not one of the multitudinous panaceas yet hatched has considered that industry may at some time be inadequate to the demands placed upon it.

Industry must needs develop, else industry will die. Freight congestion at various terminals at sundry times during the past few years was but the manifestion of the fact that the railroads of the land had been so repressed by legislative and other impediments that they had failed to keep pace in development with other industrial and commercial enterprises. The present sale of automobiles, that now exist only as steel billets or even as ore in the mines and rubber still sap in the tree, evidences the inadequacy of the motor industry to present-day demands.

How do the advocates of sovietism, syndicalism, socialism, industrial demoncratization or what not—granting that anyone of them could maintain any industry—expect that any new venture could be started? When all capital as it now exists has been confiscated, divided equally among the workers, and by them scattered to the four winds, from whence and where will the promoter of any new enterprise derive the funds necessary to start it going?

Any enterprise, regardless of its character, dimensions or usefulness, is liable to disaster from enemies either within or without. In a socialistic or sovietistic state who will secure the necessary franchises, for, we will say, a railroad extension, attend to the infinite details of construction, see to matters of special or temporary finance in times of depression, protect the enterprise from the onslaughts of manipulators and pirates as well as from the ravages of political leeches? Experience has shown that all of these duties must be performed if the rocks of financial shipwreck are to be avoided.

Even if some laborers could be found willing to risk a part of their savings in a new venture, would they be satisfied with the meager return of a few per cent. on

a meager valuation of actual construction, while any real profit goes to the men employed?

It is doubtless highly probable that such laborers would prefer to invest their savings (provided they had any) in something else and leave the inauguration of any and all new enterprise to others. And it is extremely problematical if others, foolish enough to venture investment in risky, poorlypaid new enterprises, and wise and sagacious enough to make their dreams a reality, could be found.

Sooner or later industry would thus cease to be. A lack of growth is the beginning of decay.

Fallacies in Management.

In Sardinia and Sicily it is a part of popular education to train every man to resent every injury and insult with his knife. The average peasant believes that revenge is a sacred duty and the vendetta a noble institution. Some of our mountaineers hold the same idea with regard to the feud. The rest of us, however, have shaken ourselves clear of such ideas. They went into the discard quite appropriately with the post chaise and the sedan chair. They do not fit modern civilzation.

But do not think for a moment that we are without a few fallacies of like character, and that we are not being trained even today to believe in certain false premises. Many managers, even in this year of grace, fully believe that there is something that may rightly be termed a correct managerial manner. Many superintendents and foremen are of the opinion that it is necessary every so often to assert their authority and exhibit the fact that they really are bosses, and to that end they roughly and loudly resent incivilities and rebuke follies.

In the minds of many a man there is an uncomfortable feeling that things have been going along smoothly for so long that it is time for him to assert himself, or his dignity and authority will be overlooked. An explosion comes therefore, and thereafter the manager prides himself that all the good that follows is the result of his exhibition of immoderate temper.

He is not aware apparently that there are any number of successful business men who have no managerial manner, who never worry themselves about their authority, but who go along without any preconceived theories of just how unpleasant a manager should prove himself to be and just how often he should exhibit that he is made of trinitrotoluol.

But the upshot of this friendliness, he will say, is that no one knows who is boss. Precisely; the idea goes around that all are partners in enterprise and that every man is striving together to "put the job over." There may be some few embarrassing moments when visitors come to the plant, but those moments are the test of the real democracy of the manager. If he meets the situation then, it will be met on all occasions. For in the minds of strangers there *is* a proper managerial manner, a proper relation between officials and subofficials, and between both, and what we term—save the mark—men. In passing may we not ask:—Are not officials and subofficials also to be so classified?

In every organization there are some who do not respond to courtesy or consideration, and the only cure is to show them the gate; and there sometimes the union bars the way. Is that condition universal? Not always; sometimes the union very quietly and unostentatiously holds the gate open, for undesirable workingmen are often still more undesirable in the union.

And again, sometimes the union is no fairer than the least conscionable of the men, and there are even cases where the wrong man has to be kept for other reasons. In such cases the advice just given cannot be followed; but beware, nevertheless, of the old belief that any official needs periodically to be unpleasant if he would have an efficient organization.

After long and expensive propaganda, labor has almost convinced the world that it should be kept scot free of the Sherman Act, the injunction and taxes, and now, having sighted the Promised Land, it is about to undo all its years of indoctrination in one red hour of revelry. If it does what it threatens, the starving, shivering world will with difficulty believe in the civil rights of the labor trusts that brought it to so sad a pass.

A Great and Growing Hazard of the Mine.

NOT ONLY in the mine but on the surface in transportation the growing hazard. Above ground the dangers of the railroad, of the street car and automobile, have added greatly to the accident mortality of mankind, and the flying machine bids fair to add greatly to that death roll. The mine has suffered as has the surface. However, there is a cure for the matter in better track and equipment.

There is no reason why so many mine-car accidents should occur. We would certainly reduce their number if we would conscientiously inquire into the many ulterior causes that lead to every accident and if we would define an accident somewhat broadly as something that happens that ought not to have happened. A derailment is an accident, even if it kills or hurts no one. The etymology supports us in so regarding it, and the needs of safety demand that we should take that view of it.

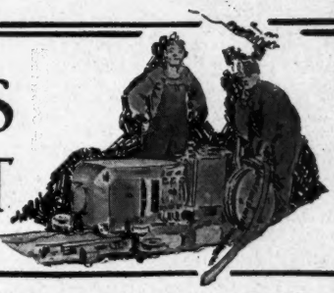
In Great Britain, the Board of Trade investigates railroad accidents whether they cause a loss of life and limb or do absolutely no damage to either. It is true that if, at the mines, we investigated every pile-up, we should do little else, though it seems likely that if a single one were properly investigated, the conclusions would be so valuable, that when the lessons they taught were followed, few further accidents would be experienced.

Accidents from mine cars have been given little attention. They should have been studied with the most painstaking care. Instead, few records have been kept. We cannot tell how many arose from locking bumpers, falling roof, room frogs, dirty track, low joints, broken wheels, thrown switches, broken couplings, excessive or tight gage, bent axles, sharp curves, pushing trips and other causes.

That it is a serious matter is shown by the fact that in 1916, 390 persons were killed underground by mine cars and locomotives. In 1918 the number rose to 506. In 1916 there were 59 killed by mine cars and mine locomotives on the surface while in 1918 the number had risen to 87. Every superintendent, who would reduce his accidents, must watch the mine-car and mine-locomotive hazards.

The cure rests in better tracks, stiffer cars, better lights and more careful crews. Avoid being satisfied with the official classifications of the Bureau of Mines in describing accidents. No one knows better than Albert H. Fay, of that Bureau, that they are merely valuable for tabulation. Any investigation to be good and productive of safety must be more detailed.

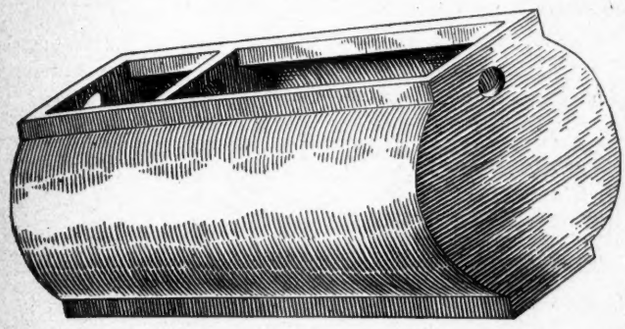
NEW APPARATUS AND EQUIPMENT



New Form of Septic Tank

A new and improved form of septic tank has been placed upon the market by the Universal Septic Tank Corporation, of Beaver Falls, Penn., with an office in the Oliver Building, Pittsburgh, Penn. This tank is designed upon no new principles and utilizes no new septic processes. However, it is claimed to be a decided improvement upon previous designs.

This tank, containing two compartments, is built integral of reinforced concrete. It thus possesses a great



REINFORCED-CONCRETE SEPTIC TANK

advantage over the double tank in that no ground movement or subsidence can stress, injure or break the connection between the two compartments. When both tanks are cast integral there is of course only one setting operation when this tank is put in place.

The principle upon which these septic tanks operate is well known. In all raw sewage two types of germs exist—harmless bacteria and disease-bearing bacteria. The harmless or friendly variety thrive in the absence of light and air, while the harmful or disease germs are most virile in the presence of light and oxygen. In the closed septic tank the harmless bacteria multiply rapidly and, attaining vast numbers, consume not only the disease germs but all vestiges of organic matter as well, leaving the overflow from the tank practically clear water that may be absorbed by the soil or turned into a stream without contamination.

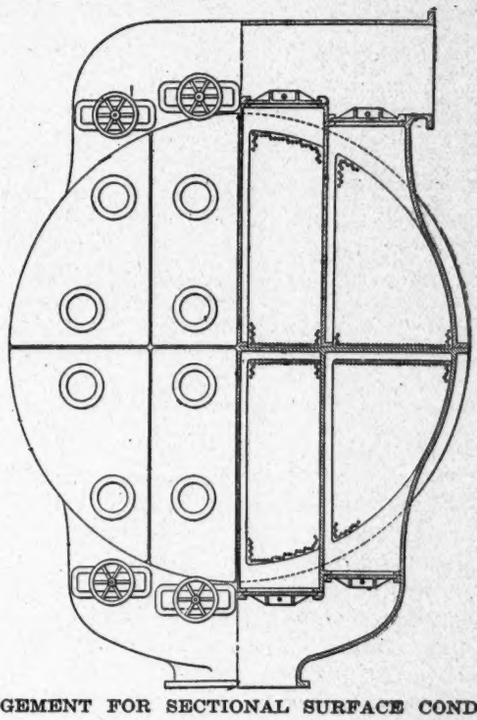
This tank is an adaptation of the L. R. S. system originated and approved by the U. S. Bureau of Public Health. The use of such a tank does away with the cesspool, provides a clean and sanitary method of sewage disposal, solves the fly and mosquito problem, prevents the possible contamination of water supply, improves living conditions and acts as a safeguard against epidemics.

A New Sectional Surface Condenser

A new development in surface condensers is announced by the Wheeler Condenser and Engineering Co., of Carteret, N. J. It is a patented "compartment condenser" that can be cleaned while in service without shutting down the turbine. Any tube or tubes may be temporarily plugged and other repairs made without taking the condenser out of service.

This condenser will enable the plant engineer to constantly maintain a clean condenser, hence a vacuum continuously high. All engineers of experience know that in addition to increasing output a high vacuum means low fuel consumption and a considerable saving in money yearly.

Upon installation of this condenser there need be no interference with the operation of the turbine. At the present time, in many power stations, even where water conditions are regarded as good, it is necessary to occasionally shut down the turbine for a period sufficiently long to give the condenser a thorough cleaning. Under such conditions, and in fact in all cases where continuous and highly efficient operation is desirable, this new type of condenser will be highly acceptable.



ARRANGEMENT FOR SECTIONAL SURFACE CONDENSER

To clean an ordinary condenser is not a difficult task, but it is time-consuming, and for that reason the man in charge is naturally tempted to put cleaning off until "tomorrow," or "next week," or "next month." During his wait for the opportune time the vacuum gradually drops, and with the drop coal consumption increases. Sometimes the loss of vacuum amounts to several inches of mercury. Hence the compartment condenser, which can be kept constantly clean regardless of load conditions, will in the long run prove to be a paying investment from the standpoints of both uninterrupted service and coal saving to say nothing of convenience.

The accompanying illustration shows the arrange-

ment clearly. The condenser is divided into four comments, each being equipped with a set of valves to control the circulating water through it. To clean the condenser while the turbine is delivering full power, the operator simply shuts off the water from one compartment, removes the cover, cleans the tubes, replaces the cover, turns on the water again, and then passes on to the next compartment, continuing this operation until all compartments or the entire condenser is clean. Thus, while one compartment is being cleaned, the others are in full operation, temporarily taking over the entire load.

New Line of Direct-Current Motors

A new line of commutating-pole, direct-current motors and generators has been introduced by the Allis-Chalmers Manufacturing Co. These machines are not only rugged and compact, with excellent operating characteristics, but the many details which contribute to accessibility, reliability and safety have been given careful and thorough consideration.

This line includes the following standard ratings: (1) Continuous rated (50 deg. C rise) motors, for applications where the power requirements are definitely known; (2) normal rated (40 deg. C. rise) general purpose motors; (3) adjustable speed motors for continuous or intermittent service, and (4) generators and exciters.

For constant-speed motors the ratings and speeds are the same as those of 60-cycle induction motors, and they can thus be used interchangeably with induction motors for direct-connected applications without changing the method of drive or the ratio of gearing. Adjustable-speed motors, intended particularly for machine-tool and similar applications, are provided for 2:1, 3:1 or 4:1 speed range. Generator speeds also correspond to those of induction motors, thus permitting the direct coupling of the machines in various combinations to form motor-generator sets.

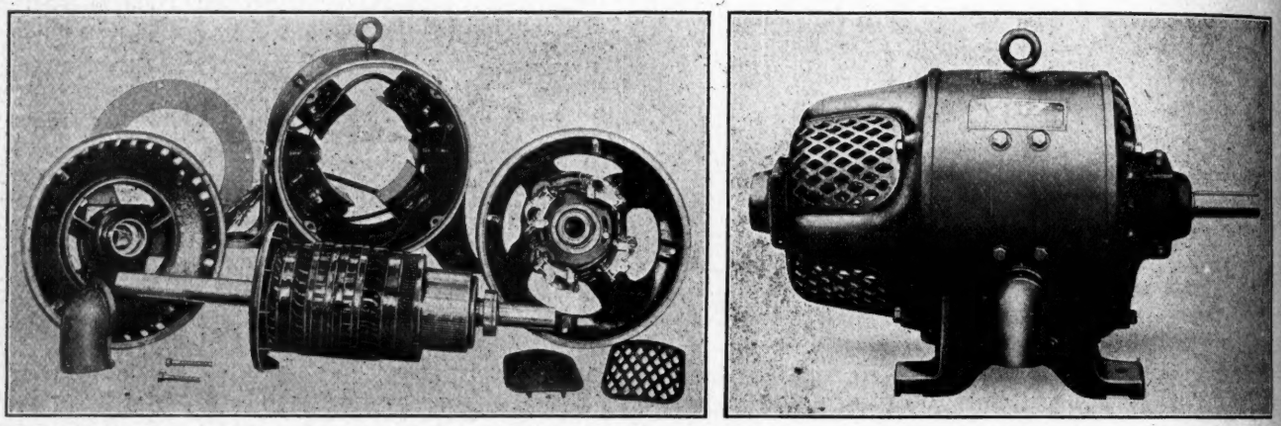
The motors are now built in capacities from ½ to 50 hp., while generators range from ½ to 40 kw. Larger sizes are under development. Cast steel yokes, combining light weight and rigid construction, are used for the larger ratings while the smaller machines, which are of the bi-polar type, have riveted frames.

The accessibility of the commutator is apparent from the illustrations. Protecting grid covers can be provided for these openings in the front bearing bracket; they are readily attached and may be applied even to machines in service, without affecting the rating. Solid covers are used with completely inclosed motors, the rating of these machines being somewhat lower than open or semi-inclosed motors.

All machines have ring-oiling, dustproof bearings, while the windings are treated to resist oil and moisture. Conduit terminal boxes, regularly supplied, have removable covers, giving ready access to the terminals. The box-type brush holders are adjustable for tension and are suitable for either direction of rotation. Each holder can be removed independently with a screw driver or wrench. At least two brushes per stud are used. The field coils are wound on metal spools, which prevent their movement, and are protected by an outside layer of enameled wire.

The armature core has the laminations riveted together, permitting the removal of the shaft without dismantling the core or commutator. In ratings of 20 hp., 850 r.p.m. and larger, the core and commutator are built on a sleeve, so that the shaft can be pressed out of the finished armature without disturbing the windings.

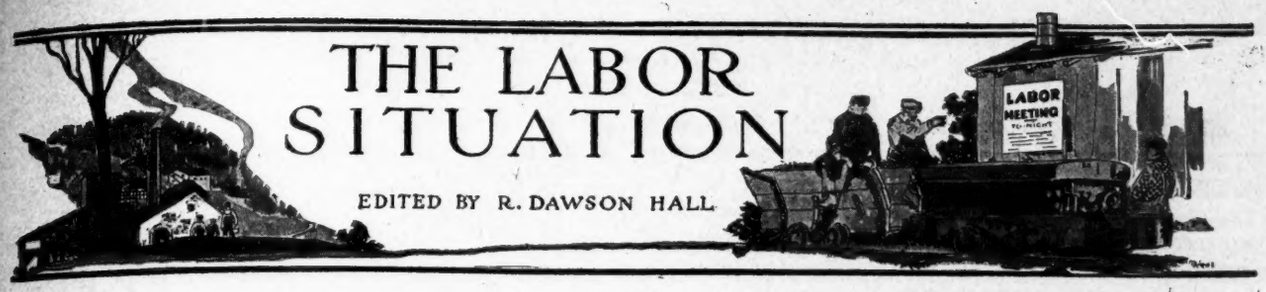
A thorough ventilating system has been provided. The air is drawn out by the fan mounted on the rear armature head; fresh cool air flows in through the liberal ventilating ducts and takes up the heat from the iron and windings. This heated air is forced out through openings in the periphery of the rear bearing bracket. With thorough ventilation the internal temperatures are kept low, thus greatly prolonging the life of the insulation.



DISASSEMBLED AND ASSEMBLED VIEWS OF A COMMUTATING-POLE, DIRECT-CURRENT MOTOR

This new line, which is designated as Type "E," is new throughout, no attempt having been made to redesign old apparatus or to employ parts from any previous machines. The motors are designed for belted as well as direct-connected applications.

When an explosion has occurred at a mine some room or building near the entrance of the mine should be designated and used as executive headquarters and placed in charge of some local official or employee who knows where materials, tools and supplies are available in order that there may be as little delay as possible in supplying volunteers, who come from other mines. The foremen of the different gangs of workmen should keep the executive headquarters notified of the progress of their work so that officials and inspectors on arrival may know just what has been accomplished.—*Rescue and Recovery Operations in Mines.*



THE LABOR SITUATION

EDITED BY R. DAWSON HALL

General Labor Review

After two conferences, one at Buffalo and one at Philadelphia had failed to induce either mine workers or operators to change their positions a general strike of the bituminous coal mine workers was called by the union to take place on Nov. 1. Immediately thereafter a conference was called by the Secretary of Labor.

In the anthracite region the contract miners of the Jermyn colliery of the Hudson Coal Co. obtained a favorable decision from the Hon. Charles P. Neil, the umpire for the Conciliation Board. The miners claimed that they should be paid the same rates in the gob chambers as were, and are, paid in the gob chambers of the Powderly colliery of the same company.

It was claimed by the miners that, when the work in question was started, the company paid the men the same rates paid in the Powderly colliery with the exception of the rate of 0.6473 and $1.294 per yard which was being paid in the gob chambers of the Powderly plant.

At Johnstown, in central Pennsylvania, the owners of seven mines signed the scale presented by the United Mine Workers of America and orders were issued for the men on strike to return to work. In all, 17 of the operations in that vicinity have signed the scale; 13 still refuse to do so. Including the men of the Cambria Steel Co., there are 3,000 mine workers around Johnstown who were still on strike on Oct. 7.

At Bridgeport, Ohio, sympathizers with Thomas J. Mooney to the number of several hundred, on Oct. 6, celebrated a one day's strike in protest against his imprisonment. The mines of the Wheeling & Lake Erie, Virginia, Hill and Occo coal companies at Bannock, Lafferty and Black Oak were all closed down.

At No. 10 mine of the Pittsburgh Coal Co., Athens County, Ohio, a strike, ended by the authority of the officials of the union, took place when two union mine workers joined the National Guard.

Mine Workers Wage Conference

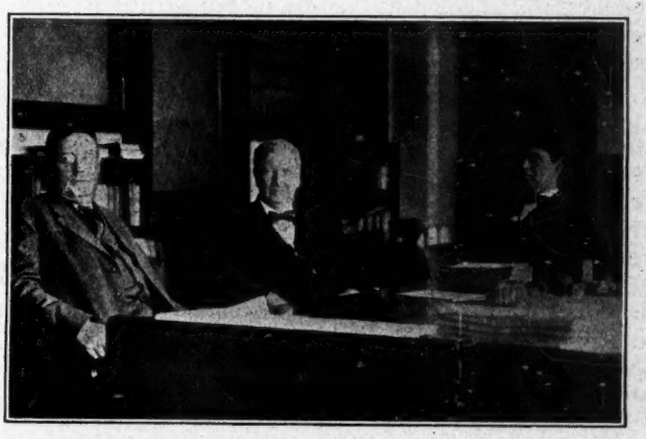
On Oct. 9 the operators of the Central Competitive District and the officials appointed to meet them by the United Mine Workers of America failed to assemble, though Oct. 9 was the date that was named when the Buffalo conference came to an unsuccessful end. On Oct. 10, however, the meeting reassembled, the place of session being the Bellevue-Stratford Hotel, Philadelphia, Penna.

The meeting lasted only one hour, as the proceedings emphasized the hopelessness of the situation, for neither side would modify its position. It was decided eventually to submit all the proposed wage raises and working conditions to a subcommittee consisting of two operators and two mine workers from each of the four districts—Western Pennsylvania, Ohio, Indiana and Illinois.

The operators held that the war was not over and that no contract could be made to date from any other day than the day on which the war would end excepting, however, April 1, 1920, which was the date set as a limit for the termination of the contract. A statement issued by Ellis Searles, editor, United Mine Workers Journal, was to the effect that the mine workers last year worked only 198 days and yet the miners made an average earning of $1,434. In Indiana the average wage was $1,400 and in western Pennsylvania $1,200.

The following day, Oct. 11, found the subcommittee as firmly determined in its ways as the whole conference had been, and an adjournment was the only thing they could agree on. This adjournment was taken on the morning of Oct. 12. Mr. Lewis gave out a dishonest statement to the public in which he said that the United Mine Workers were ready for an agreement, and that the operators proved by their action that they were not.

Yet the United Mine Workers' officials were bound by a hard and fast—and ridiculously excessive—program, whereas the operator delegates were at liberty to make a contract.



CONFEREES IN THE MINING DISPUTE

From left to right: T. T. Brewster, Secretary Wilson and J. L. Lewis.

They were not willing to make it operative Nov. 1 because the old contract was still in force and because they questioned the justice of wage increases and unalterably voiced public sentiment by condemning shorter hours. Dr. H. A. Garfield wrote a letter to the bituminous operators saying that the miners were "incorrect in taking the stand that the agreement has expired."

Mr. Lewis declared after the meeting that he would return to Indianapolis and issue 4,000 copies of the strike order calling for a cessation of work on Nov. 1. Accordingly the order was issued on Oct. 15. It called on "the members of our organization, employed in and around the mines of the bituminous coal-producing districts within the jurisdiction of our organization in the United States to cease the production of coal at midnight on Friday, Oct. 31, 1919. The strike thus called will continue in full force and effect until terminated by official order."

On the same day, toward evening, Secretary of Labor William B. Wilson announced that he had, as mediator, assumed jurisdiction under Section 8 of the law creating the Department of Labor and had summoned John L. Lewis, acting president of the United Mine Workers of America, and Thomas T. Brewster, spokesman of the coal operators, to meet him on Friday, Oct. 17.

The Steam Jet Ash Conveyor

By T. A. Peebles
Pittsburgh, Penn.

SYNOPSIS—*Mechanical conveyors are excellent devices for moving coal or other non-abrasive material in the boiler house or elsewhere, but ash being highly abrasive soon cuts the moving parts. The steam jet ash conveyor, since it has no moving parts, is not subject to this difficulty and parts worn out may be easily and quickly replaced. They also tend to allay dust and exert a more or less pronounced ventilating action upon the rooms or tunnels where installed.*

THE development of steam-generating apparatus has not kept pace with the development of power-generating equipment. The engine room has been made clean and attractive, while the boiler room has too often been looked upon as a hot, dirty and disagreeable necessity, operated by men "strong in the shoulders and weak in the head." This condition has existed in spite of the fact that the economy of steam-consuming apparatus is determined by the design and is affected only slightly by operation, while with steam-generating apparatus operation is an important factor.

The increased price of fuel and labor has forced power producers to make a careful analysis of steam-generating costs. In every case such an analysis has shown the necessity for the installation of the most economical equipment and of attracting to the boiler room the highest possible grade of labor. As a result a new standard of boiler-plant design has been established, including the use of a mechanical stoker, coal and ash conveyors, instruments and automatic regulators, all installed in a well lighted, well ventilated building. The results obtained have justified the rebuilding of old plants along modern lines.

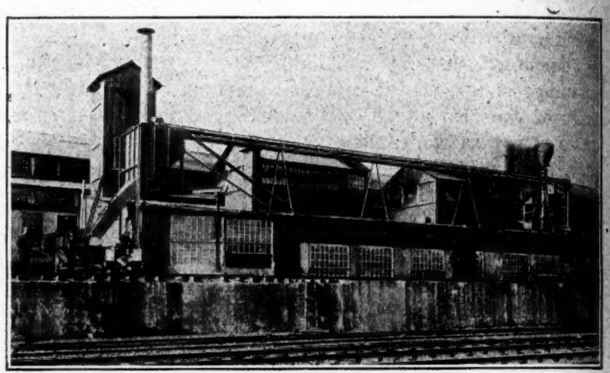
The installation of mechanical stokers, coal conveyors, instruments, etc., seldom presents construction difficulties that cannot be easily overcome, but the disposal of ash is often difficult on account of the nature of foundations, location of sewers, relation of high-ground water level to boiler-room floor, or other local limitations.

Because of the abrasive action of ash, those types of conveyors that handle coal most successfully are not always suitable for handling ash, and the manufacturers of such equipment often recommend the installation of separate ash conveyors of different design. A satisfactory ash conveyor must meet the requirements of reliability, safety, low cost of moving the material, cleanliness and ease of installation.

The following analysis of a steam jet ash conveyor will show the manner in which this particular variety meets these requirements. This type of conveyor depends for its operation on the fact that air traveling at high velocity will carry in suspension material heavier than itself. The flow of air through a steam jet ash conveyor is produced by a jet of steam introduced through a properly designed expanding nozzle, usually located in an elbow fitting, where the direction of travel is changed. Conveyors have been installed using pipe of 6, 8 or 10 in. in inside diameter. It has been found that a man can feed ash at the rate of about 5 tons per hour, and this is therefore the most economical capacity for a conveyor of this type that is to be operated by one man.

There is a critical air velocity below which the conveyor becomes sluggish in handling the heavier particles, and this establishes the minimum rate of air travel. With this velocity, the capacity of an 8-in. conveyor is from 5 to 6 tons per hour, which is about the rate at which the ash can be handled by one man; and this size is therefore the most economical for most plants. A smaller size will be wasteful of labor because its capacity is less than that of the operator and it is also wasteful of steam because the greater ratio of surface to area results in an increase in friction. A larger size is not economical, not only because a greater amount of steam is required to create the required velocity in the larger pipe, but because the increased capacity which is in excess of one man's ability to handle ash cannot be utilized.

The steam jet ash conveyor meets the requirement of reliability because of its simplicity, small number of parts requiring replacement and the ease with which



OUTSIDE INSTALLATION, SHOWING METHOD OF PLACING ASH FOR REMOVAL BY CARS TO DUMP

these replacements can be made. Since there are no moving parts, no lubrication is required and there are no adjustments to make. Breakdowns in a true sense do not occur, and the replacement of any part requires only two or three hours' time and can easily be made between periods of operation. A high degree of reliability is thus secured and it is never necessary to resort to hard labor for ash removal while conveyor repairs are being made.

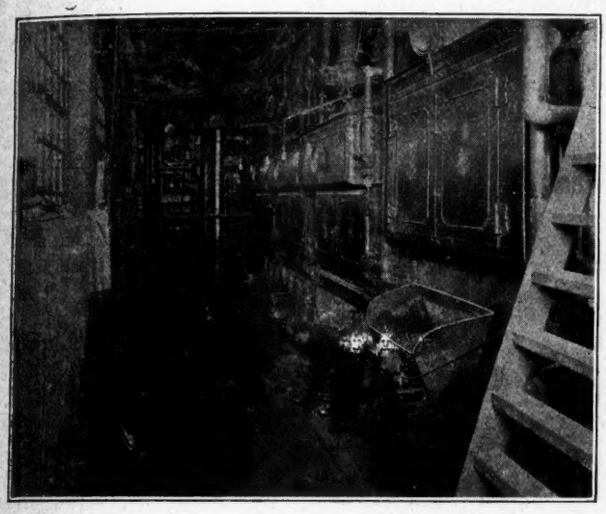
A pipe running from the ash pits to the point of ash disposal presents no danger of accident. There are no moving parts in which an operator may be caught and injured. It is thus assuredly safe. The cost of handling ash is made up of fixed charges, maintenance, power and labor. The small first cost of this type of conveyor makes fixed charges and depreciation low, and maintenance which is confined principally to inexpensive renewable wearing parts is also slight.

The steam jet conveyor has frequently been criticized because of the amount of steam required for its operation, and there was a time when such criticism was justified. Careful engineering analysis of what takes place in the conveyor pipe has led to certain definite

improvements which materially reduce the steam consumption and minimize wear.

The frictional resistance within the conveyor increases rapidly with the velocity. The introduction of steam increases the volume and velocity in the conveyor beyond the jet. Excessive friction may result from the excessive velocities and incorrect proportioning of the steam jets. In fact, a point is sometimes reached where the operation can be greatly improved by using less actual steam. The old theory that a leaky joint at any point would interfere with the operation of the conveyor has been exploded, and it has been definitely proved that for best operation certain points in the system should actually be vented in order to offset the increased volume arising from the admission of steam. The velocity is thus reduced to that required to convey ashes, diminishing the abnormal friction due to high velocity together with a large decrease in steam consumption and wear.

The labor involved in the operation and maintenance of this type of conveyor is a small item. The ashes



INSIDE INSTALLATION, SHOWING METHOD OF HANDLING ASH

can be hoed or shoveled into the intake at least as easily and rapidly as into a car or wheelbarrow, and the conveyor promptly discharges them to the point of disposal. The work of repairs can be done by any man who can use a wrench.

The strong suction at the ash intake draws in all dust and gas liberated in the handling of ash, and clean dustless operation results. There are cases on record of ash tunnels so hot and full of gas and dust that men refused to work in them. These have been transformed by the installation of this type of conveyor into resting places where the men would go to eat their lunches.

The high cost of labor has forced plants to install labor-saving devices, and a suitable mechanical means of conveying ash became a necessity. The steam jet conveyor offered the best solution in many cases. It is usually possible to find some means of leading a pipe from the ash pits to the desired point of ash disposal, and unexpected obstructions can be avoided if the parts are provided with joints that permit a pipe or fitting to be turned to any desired angle. The conveyor can be readily adapted to any extension or alterations in the plant, and it is never necessary to discard material already on hand because of such improvements as such material can be readily utilized.

A steam jet conveyor, excellent in every detail of design, would be a total failure unless made of the proper material. Ash is highly abrasive, and unless every part of the device that comes in contact with the ash is made of the proper material, the results will be unsatisfactory.

A satisfactory installation depends upon three essential factors—proper design, suitable material and correct application. The successful manner in which these factors have been combined in the steam jet conveyor is evidenced by the number of systems purchased by engineering organizations after a careful study of the different types of apparatus available.

Legal Department

A MISSOURI MINING LEASE INTERPRETED—A lease covering coal lands in Missouri and executed in 1900 gave the lessee twelve years in which to remove all minable coal, in accordance with first-class mining practices, and provided that minimum royalties should be paid for each of the first eleven years regardless of production. In the event that more than the minimum quantity of coal should be mined annually, it was agreed that six cents per ton would be paid as royalty. There was a clause extending the time for mining against delays caused by strikes, breakage of machinery etc., and another reserving to the lessee the right to remove machinery, etc., after complying with the lease obligations. Interpreting the lease as a whole, the Missouri Supreme Court holds that the lessee, having retained possession of the premises and continued to mine coal, was bound to pay the minimum royalties for the first eleven years, and six cents a ton for all coal mined afterward, regardless of whether the land contained sufficient coal to cover the quantities contemplated by the lease; and that until payment of such amounts the lessee was not entitled to remove machinery, etc., installed on the premises. (Union Trust Co. of St. Louis vs. Wear Coal Co., 199 Southwestern Reporter, 230.)

RISK INCIDENT TO BLASTING OPERATIONS ASSUMED — Plaintiff, a coal miner experienced in loading and shooting charges of dynamite and powder, was injured by explosion of dynamite in a drill hole, which he was cleaning out on his and his foreman's supposition that the dynamite had previously exploded in an attempt to explode it simultaneously with several other nearby charges. Judgment in defendant operator's favor, in a suit brought by plaintiff to recover damages, has been affirmed by the Missouri Supreme Court, on the ground that the evidence sustained a finding that the accident resulted from an ordinary risk naturally incident to the employment. The Supreme Court said: "It is too well established to admit of controversy that the servant assumes the ordinary risks of his employment—in this case the manifold dangers of mining with explosives—and under such circumstances the duty of the master is confined to the exercise of ordinary care. . . . Plaintiff's familiarity with this character of work and the dangers attendant upon its performance freed the foreman, as the alter ego of the master, from more than the discharge of that general duty required of the master toward an experienced servant. . . . Had it been shown, as it was not, that the plaintiff had no knowledge or a limited one of the nature of the work, the rule as announced would have been inapplicable." The court further notes that the legal rule requiring an employer to provide his workmen with reasonably safe places in which to work is limited to such dangers as, considering the nature of the work, can reasonably be anticipated and guarded against. It is not applicable in a mine where an employee is continuously changing his place of labor, unless the dangerous nature of the place is due to a defect directly traceable to negligence of the employer or one which he could and ought to have remedied. (Britt vs. Crebo, 199 Southwestern Reporter, 155.)

DISCUSSION *by* READERS

EDITED BY JAMES T. BEARD

Finding a Mine Door Set Open

Letter No. 3—Regarding the question raised by Richard Bowen, COAL AGE, Sept. 11, p. 462, in reference to the answer given in a certain textbook, explaining how a man should proceed with the examination of a mine after finding a door set open whereby the ventilation was destroyed, let me say that I fully agree with the answer he quotes as given in the textbook, namely, that the fireboss should close the door and wait a proper time for the circulation to be restored before proceeding to continue his examination.

This answer clearly assumes that the mining laws relating to gaseous mines have been strictly obeyed. For instance, the Anthracite Mine Law of Pennsylvania (Art. 12, rule 38) requires that every workman shall see that no gas blower is left burning when he leaves his place. Failing to extinguish a burning feeder, he must report the matter immediately to the mine foreman. As I have stated, the answer assumes that this law has been carried out, in which case there would be no feeder burning at the face of room No. 5, as he has assumed.

Relying on this fact, the answer states very properly that the door should be closed and time given for the circulation to be restored, before the examination of the working places in that section is continued. In my opinion, it is the proper way for a fireboss to start his examination of a section of a gassy mine at the intake end.

The second feature presented by Mr. Bowen puts him in the position of questioning the statement that the fireboss "should follow the intake current into the mine." Let me say that, not only is this the practice commonly recommended in textbooks, but I believe it is safe to assume that 100 per cent. of all firebosses, superintendents and managers would advise the same. For my part, I fail to see how any competent fireboss would attempt to examine a gassy mine by following the return air.

Assuming, for the sake of argument, however, that the conditions are as shown in the sketch or figure presented by Mr. Bowen, with the exception that we will say no feeder is burning in Room 5. Is it not true that the fireboss making the examination would only become aware of the door standing open on the gangway when he had reached Room 7, after passing through and examining all places turned off the return air-course and the last room, No. 8, turned on the gangway? When he supposed his work was more than half completed he suddenly finds that something is wrong and what he has done must count for naught and be gone over again after remedying the trouble he has just recovered.

Mr. Bowen states that, as fireboss in many large gaseous operations, it has been his invariable custom to leave all doors and brattices the way he found them, until he had ascertained the actual conditions in each working place in the section. In following this practice, now, we will suppose that he, starting on the return, has reached Room 8 on the gangway and discovers that there is no air circulating in Rooms 7, 6, 5, 4, 3 and, at last, finds gas at the face of Room 2. All his work now counts for naught, as he must go down to the gangway, close the door and wait sufficient time for the circulation to be restored and sweep away the gas. Then, he must start again by entering Chamber 1 on the gangway and examining each place in turn, including the last chamber 8 and the same number of chambers on the return air-course, all of which he had previously examined and found safe.

Finally, applying this plan of proceeding to any gaseous section requiring about three hours of hard work, it is clear that this time would be more than doubled by the finding of gas in any one of the places at the extreme intake end of the section, provided the fireboss must continue to examine all rooms before closing the door. It may be asumed, of course, that his first preliminary examination has for its object only the ascertaining of the fact that there is no feeder burning or lights present, or other fire that would cause the ignition of the gas when the door is closed, and that this examination will not require as much time as the more careful examination of the places after the door has been closed and the circulation restored. However, the fireboss has almost twice the ground to go over and will not accomplish his work in the specified three hours.

On the other hand, by starting his examination at the intake end, not only is the fireboss traveling in fresh air and knows when and where the air is short-circuited; but he is doing his work safely and but once, saving time and steps. I hope we shall hear from many experienced firebosses and those in higher positions who know what the work is by experience.

Stockton, Penn. JOSEPH LAWRENCE.

Letter No. 4—Referring to the question raised by Richard Bowen, in his inquiry, COAL AGE, Sept. 11, p. 462, regarding the usual practice of starting the examination of a mine at the intake end, I would say that the answer given to the question as quoted by him from a certain textbook is correct, provided the mine is not subject to fires and gas feeders, although a gassy mine or one subject to fires would undoubtedly call for a modification of this practice.

In the plan submitted by Mr. Bowen with his question, it is evident that it would not be prudent to attempt to remove the gas shown in Room 2 if it has accumulated in great bulk, owing to the possibility of fire being at some point in the section and igniting the gas. It would be very inconvenient, however, for a fireboss to travel against the air and possibly unsafe by reason of his being compelled to breathe the gases generated by the fire.

Considering all the conditions, I believe the best course to follow would be to travel with the air and, leaving the door standing open as it was found, proceed with the examination. On reaching the fire, or burning feeder, it should be extinguished as quickly as possible. When satisfied of the condition of the section the fireboss can return and, closing the door, wait for the ventilation to be restored before taking steps to remove the gas. It may be necessary to erect a temporary brattice so as to deflect the air to the face and sweep the place clear of the gas. This plan, of course, will call for the making of a second examination of the section before the fireboss can permit the workmen to enter the mine.

The conditions to which attention is drawn in this discussion, regarding the danger due to the presence of gas or

fire, is not uncommon in the examination of a mine. If I am rightly informed, some firebosses carry gas masks with them when making the examination, which enables them to approach and extinguish a fire that it would be impossible to reach but for the mask. Without a doubt, this is a step in the right direction and may often prove of great value by enabling the fire to be put out before it has gained headway, as it would if help must be summoned and the usual steps taken before the fire can be extinguished.

Linton, Ind. W. H. LUXTON.

Letter No. 5—Referring to the question of how a fireboss should proceed with his examination of a mine after finding a door set open on the airway, it is my opinion that, having first performed his duty of seeing that the air is traveling in the proper course and the usual quantity passing on the main airway and, finding the door set open controlling the circulation of air in the section of the mine that he is about to examine, he should "danger the section off" by placing a suitable signal at the entrance and proceed at once to report the matter to the mine foreman.

In case, however, the fireboss decides to take the whole responsibility on himself and continue his examination of the section, he should leave the door standing open as he found it and proceed in the regular order, but taking every precaution and watching for the first appearance of gas. Should he find gas, as has been suggested in this discussion, he must proceed to look further to ascertain if there is any fire or light that would cause the gas to ignite when displaced or driven out. The fireboss will then know the location and amount of gas and what the results would be if the door is closed.

Having assured himself of the conditions existing in the section, he should close the door and wait a reasonable length of time before making a second examination to ascertain what progress is being made in driving out the gas. It may be necessary to speed up the ventilator or alter the circulation in the mine so as to throw more air against the gas and clear the place. If he is unable to remove the gas before the time arrives for the men to enter the mine, he must danger the place off and allow no one to enter that section.

I heartily agree with the ideas already expressed that all doors and brattices should be left as they are found, until the fireboss has ascertained the actual conditions that exist in the section. However, in a matter of this kind, where a door has been carelessly set open and left, I do not feel that the fireboss should be held responsible for what may happen as a result of somebody's carelessness. If it can be ascertained who left the door open, he should be punished in a manner to make him understand the purpose of mine doors. Spraggers and motormen often leave doors open for long intervals just to save themselves a little trouble. They are seemingly ignorant of the effect of so doing.

Regarding the question of following the intake air, there is nothing in the mining law to compel a fireboss to do this. The law requires him to see that the air is traveling in its proper course and that the usual quantity of air is in circulation. Personally, I believe that not more than 50 per cent of the firebosses follow the intake air, unless the geological conditions favor their doing so.

One thing is evident, and that is a fireboss can judge better the amount of air traveling in an airway when he proceeds against the current than when traveling with the air. Also, he can scent the smoke or gases of a fire more quickly when starting at the return end of a section than when he begins the examination at the intake end. This might save two hours or more in fighting a fire that has started at a point near the return end of the section.

When starting on a new run, it has been my practice to carefully study the various routes and pick out the one that will permit the work to be done most quickly, easily and to the best advantage, everything being taken into consideration, and still perform my duty as fireboss to the best of my knowledge and ability.

Johnstown, Penn. FIREBOSS.

Letter No. 6—As fireboss, I am now working in a gaseous mine and have been much interested in the discussion, in Coal Age, regarding a fireboss finding a door set open when starting to make his regular examination of a mine or section. All gaseous mines have two or more sections where men are working, and these must always be considered in case a door is found open in any one section, especially if the men are at work at the time.

In making the regular examination of the mine in the morning, if I found a door standing open on the airway when starting to make my rounds, I would not close the door until I had examined to know the conditions prevailing in that section. Instead, I would leave a sign on the open door to prevent anyone from closing it who might happen to be in the mine. I have learned by experience that it will not do to close a door that is found standing open, before first finding out if gas has collected anywhere in a body that would be dangerous.

Leaving the door as found, I would go as far as possible in examining the section and, if necessary, would return and get help to remove gas or extinguish any fire that might be burning. I would not, under any circumstances, close an open door before assuring myself that it was perfectly safe to do so. At times, no doubt, it may be possible to examine the conditions beginning at the return end of the section, which would give a better opportunity to detect what might be wrong. The fireboss must report to the mine foreman promptly any trouble that cannot be removed without help. But, in no case, should he close the door until he is sure that the section will be safe when the circulation is restored.

Rockwood, Tenn. FIREBOSS.

Child Labor in Mines

Letter No. 3—My attention was drawn to this subject by reading the interesting letter of A. A. Gillen, COAL AGE, Sept. 11, p. 457, in which he aptly describes the position of a hard working man, the father of an average family. In his letter, Mr. Allen has shown himself to be broad-minded, by considering both sides of the question. Like him, I believe in giving children every opportunity to gain an education. Nevertheless, in my own case, conditions were such that I was compelled to take my oldest boy from high school at the age of 14 when he was half through the sophomore grade. In doing so, I chose the lesser of two evils, cutting short the boy's schooling or depriving the family of certain necessities, as the lad was needed at that time to help out the family income.

I fully indorse Mr. Allen's statement that "boys should know what it is to do a fair day's work before they reach 16 years of age." From experience, I know that this can be done without depriving the boys of an oportunity to educate themselves in any technical calling to which they may be inclined, provided they are ambitious to accomplish the task. But where there is no such ambition on the part of the boy and the parents' finances are limited, a greater injustice may be done the family if a boy between the ages of 14 and 16 years is not allowed to go to work in place of attending school.

It will frequently happen that boys between 14 and 16 years of age, kept in school contrary to their inclination, spend their spare time in idleness and cultivate many habits that are harmful to themselves and disgrace the family. While the law is all right in general, there are many instances where it is unjust to the boy and a burden to his family to

be kept from earning his own living at the age of 14 and assisting, it may be, to support a widowed mother or younger brothers and sisters who would otherwise be dependent on charity.

Far better would it be to give such boys an opportunity to nourish their bodies and to assist in the support of the family, than to attempt to build up and develop their mental capacity to the detriment of their physical strength, and run the risk of a total collapse and failure. It is my belief, therefore, that boys of 14 should not be denied, by law, their right to work in the mine when the need of their employment can be shown.

Let me ask, how many well educated men among us were earning their own living when they were 14 years old or younger? Mr. Allen states that he entered the mine for work before he was 10 years of age. I, myself, started at 12 years of age and obtained my undermanager's certificate, at Newcastle-on-Tyne, when 21 years old, besides having received other Science and Art certificates before reaching that age and while working regularly 10 hours a day.

At the age of 27, at Edinburgh, Scotland, I obtained my manager's certificate, which was first-class. In the examination at Edinburgh, I remember, there were candidates who had not known a hard day's work in their lives and had every opportunity to prepare themselves, and yet they failed to pass the examination.

It is my opinion that work doesn't hurt a healthy well-nourished boy; but when boys are deprived of work between the ages of 14 and 16 years they will often be undernourished and those who should be assisted by their earnings are, at the same time, deprived of that support.

No doubt, the lawmakers who enacted the child-labor law were conscientious in their work; but it would seem that they did not recognize the necessity that often makes this law a burden to parents and is harmful to boys who have not the ambition to study and educate themselves.

Linton, Ind. JUSTICE.

Problem in Coal Extraction

Letter No. 7—After a careful reading of the article entitled "A Problem in Coal Extraction," COAL AGE, Aug. 7, p. 234, and taking into consideration the natural conditions described as existing in the seam, I am led to suggest a method evolved in my own practice and which, I believe, promises the largest recovery of coal at the lowest cost of production, while furnishing the greatest degree of safety.

The seam in question is said to be fairly gaseous but dry and overlaid with from 450 to 600 ft. of cover. The roof shale is described as containing slips and disintegrating rapidly under the action of the air. In order to illustrate more clearly my proposed method, let us assume that a portion of the southeast quarter in the development of the mine is under consideration.

Starting from the shaft bottom, it has been my custom to drive the main headings north, south, east, and west, thus dividing the mine into four quarters. Under the conditions assumed the main east headings are driven four abreast, which affords an intake haulage road and return airway for each section, on the east side of the mine. As these main headings are advanced, butt headings 8 or 10 ft. wide are driven, three abreast, on 1,500-ft. centers, as far as desired. From these cross-entries 8 ft. wide are also driven three abreast, on 600-ft. centers.

In this manner, the seam is laid out in panels of solid coal about 600x1,500 ft., and these are worked out on the retreating plan, as follows: As quickly as the cross-entries advance, stalls or rooms 12 ft. wide are driven, on 92-ft. centers, across the panel, holing into each other at a depth of about 250 ft. or half the width of the panel.

When the stalls or rooms are completed in any panel in Section No. 1, here considered, the work of drawing back the 80-ft. pillars in that section is started at the extreme northwest corner of the section. In driving the stalls or rooms, crosscuts or breakthroughs are made on 40-ft. centers, which not only affords good ventilation but expedites the work of drawing back the pillars.

The extraction of the pillars is now assumed as being completed in the first panel of Section 1, nearly completed in the second panel, and well under way in the third panel of the section. The work of drawing pillars is in progress in the first panel of Section 2, while rooms are still being driven in the second panel.

It should be observed, here, that the general line of fracturs is thus carried on a more or less fixed angle with the cross-entries. While this angle may vary with the conditions in the seam and the overlying strata, it has been my custom to carry the breakline on an angle of about 25 degrees with the entries.

It may be found desirable, at times, to start the work of extracting the pillars at opposite ends of each alternate section. For example, while retreating south in Section 1, as here suggested, this work may be conducted retreating north in Section 2, by starting the robbing at the southwest corner of that section. When this is done, all the coal from Section 2 is taken out on the haulage road on the east of that section. By using the worked out section for the return air, the danger of explosion is reduced to a minimum.

In my experience, the use of this method has proved an almost absolute guarantee against the loss of coal to any great extent. I would mine this seam in the center, say 3 or 3½ ft. above the bottom, by means of a mounted electric coal cutter, and blast all narrow work with four shots, using permissible powders.

None but approved electric mine lamps should be used and all open lights prohibited. I would employ storage battery locomotives for gathering purposes. It is my belief that if this method is properly handled it will give the best results in 80 per cent. of all coal seams, especially if the plan is modified to suit the local conditions.

Harmarville, Penn. C. W. ATKINS, Mine Foreman.

Letter No. 8—In the discussion of the problem presented in COAL AGE, Aug. 7, p. 234, regarding the question of obtaining a larger percentage of extraction, in the working of a seam of coal, it seems of prime importance to remember that the cost of a higher extraction must always be less than the price of the salvaged coal. In other words, it is easy to get a higher extraction of coal when no limit is placed on the cost of the operation. Moreover, in the discussion of this question, due consideration should be given to the relative cost of coal lands in different districts.

The problem presented in the article mentioned is the working of an 8½ to 11-ft. seam of coal, carrying an overburden varying from 450 to 600 ft. in depth. The top coal in this seam is left up to protect the shale roof, which disintegrates rapidly under the action of the air and contains numerous slip faults that often extend down through the top coal. The seam itself contains a hard silicious shale or "blue band," averaging 1½ in. in thickness.

The conditions described correspond closely to the Franklin-Williamson County coal field of Illinois, where the low cost of coal land has assuredly been the reason for the low percentage of extraction in that field, generally less than 50 per cent. I have frequently heard this question argued by the coal operators, superintendents, bosses and miners in that field, practically all of whom agree that on the average not more than 50 per cent. of the coal is taken out.

At one mine, in particular, I have seen thoughtful and intelligent efforts made to increase the extraction of the coal without making its cost prohibitive. My observation convinces me that a system that would work out all right in one place might not work at all in another district, and perhaps not even in an adjoining section of the same mine. For this reason, I conclude that any successful system must be a compromise that would work well in at least a majority of the mines in the field in question.

As the locomotive of today, which is a mechanically wonderful contrivance, is the product of scores of minds, each of whom has added some improvement; so, in a smaller way, the ideas I am about to present make slight additions to a method evolved in the experience of other mining men. The basic principle of the method was, I believe, first tried out successfuly, in this field, by James McSherry, of Duquoin, while in charge of a small local mine.

MINIMUM AMOUNT OF COAL REMOVED

The underlying principle on which the success of the method depends consists in the taking out of but a small percentage of the coal when driving up the rooms. For instance, in applying this principle, where the average distance between room centers was 40 ft., this was increased to 60 or 70 ft., which provided for a room pillar large enough to permit of turning a full width room in the pillar. This provides for one condition.

Where rooms were driven 18 ft. wide, and 230 ft. long, with crosscuts every 60 ft., it was Mr. McSherry's plan to start a room in the last sixty odd feet of each pillar, as soon as the last crosscut was through. These rooms driven up the center of each pillar gave the effect of short rooms driven on 35-ft. centers and sixty odd feet deep, in the last tier of pillar stumps, while two-thirds of the coal was left behind untouched and provided ample protection.

When these short rooms have been driven up, the machine is dropped back to the next row of crosscuts and starts to drive rooms in that set of pillar stumps, while the top coal and the remaining pillars are being drawn back in the section just vacated by the machine. The same method is followed in taking out each section, until the last set of stumps is reached, when the machine is started cutting into the pillar from the entry.

When driving rooms 24 ft. wide on 70-ft. centers, which practice is sometimes followed, splitting the pillars in this manner will leave a theoretical 11-ft. pillar, which will generally shrink in practice to about 8 ft. This, however, has been found just enough, in the average of this field, to hold the roof until the loader can get the top coal down, though not enough to carry over a squeeze.

By starting men in the rooms at the head end of the entry, the entry pillar can be drawn at the same time as the room stubs are robbed and a theoretical extraction of 80 per cent. may be obtained from the panel. Barrier pillars should be worked out by short rooms, as in the sketch accompanying the original article. But, owing to the higher percentage of extraction in the panel, a surface subsidence will usually take place and relieve the weight and insure a larger extraction of the coal in those pillars.

Having observed closely the successful working of this plan at Duquoin, I conceived the idea of adding to it or modifying the scheme in a manner according to the following variation which I will now suggest and describe. One often hears the statement made that it is usually better to approach old workings "face on," instead of driving rooms alongside with a protecting pillar, that it is hoped, will keep the weight from coming over. Should this pillar, for any reason, become too thin the whole room may be lost and frequently other rooms adjoining, but if the pillar is too thick, much coal is lost. On the other hand, the advantage of approaching the old workings "face on" is that if one room should hole through, the opening being small can be easily stopped and the adjoining rooms watched more carefully.

It was chiefly to obtain this effect that the scheme suggested itself to my mind of cutting off the headings approaching old workings or a boundary line, at a full room-length distance therefrom, by driving a pair of cross-entries parallel to said workings or boundary, as shown in the figure. However, further thought showed me that, in order to provide the required number of rooms to keep the machines busy, this plan requires the working out of two adjoining panels simultaneously, which gives also a longer open space for a break.

As may be assumed, the narrow work is stopped at about a room length from the old workings or the same distance from the boundary of the company's property. From this point, 18-ft. places, if feasible, are turned off at right angles and driven in a room length toward the old works or the boundary line. This is done as development work, and when the pillars are ready to be pulled back, men should be started in all the rooms at once, which should be enough to make a full machine run.

TWO MACHINES ARE EMPLOYED

The same method is employed here as described previously. The rooms are driven to the last crosscut before the face and the remaining distance is worked out by splitting the pillars up to the boundary or barrier pillar. Enough new rooms can now be started to make up a new machine run and to fill out the run of the first machine, as it drops back on the next set of split pillars. In this manner, two machines can be kept busy, while the original set of rooms is entirely worked out at a maximum speed.

In the working out of this plan, there will result an open space, with the exception of thin strips of pillar 8x60 ft., extending for a distance of approximately 900 ft. and running for a distance of 200 ft. in depth at the center to over 300 ft. at the side. The breakline can then be carried back in the shape of a spread out and inverted W (M). Care should be taken to cut the places in such order that the breakline will be maintained as started.

The only disadvantage that I can see, in the use of this plan, is that where gathering motors are employed, they will not be able to deliver empties on one side of the panel and pull loads off the other side, during the time they are working on the first set of rooms, but will have to double their run for this distance. Great advantage will be gained, however, in approaching old works "head on" and in quickly obtaining a sufficiently large open area to induce a fall that will break to the surface, and working back with this break following. I shall appreciate a full discussion of this plan, by readers, as the proposition has not as yet been tried out in actual practice.

Duquoin, Ill. MINING ENGINEER.

CORRECTION

Attention has been kindly called to a typographical error that occurred in the next to the last paragraph, in the reply to an inquiry regarding the "fluid ounce," on p. 337, in the issue of COAL AGE, Aug. 21, where the volume of the pint was given as 0.43718 liters (437.18 c.c.), instead of 0.47318 liters (473.18 c.c.) This paragraph should read as follows: There are practically 16⅔ fluid ounces in a pint (liquid measure, U. S.), since 1 pint is equal to 0.47318 litres, or 473.18 c.c., and 473.18÷28.3495=16.69, say 16⅔ fl. oz.

EXAMINATION QUESTIONS

ANSWERED BY
JAMES T. BEARD

Tennessee Foreman's Examination Held at Nashville, September, 1919

SELECTED QUESTIONS.

QUES.—What are the duties of a mine foreman?

ANS.—The Mining Laws of Tennessee require the mine foreman to keep a careful watch over all ventilating apparatus, airways, entries, travelingways, timbers, pumps and drainage, and to see that the miners advance their excavations safely, taking down all dangerous coal, slate or rock, or securing the same by props, caps and other timbers, which the foreman must keep at some convenient point near the entrance of the mine and deliver to the miners at their working places as needed.

The foreman must see that all breakthroughs, in Class A mines generating firedamp, are made not more than 60 feet apart in entries or airways, and not more than 75 feet apart in rooms, unless special permission is granted by the chief mine inspector to extend these distances in any particular case. In Class-B mines, generating dust in dangerous quantities, these distances are extended to 67½ feet on entries and 82½ feet in room pillars. In Class C and D mines generating neither firedamp nor coal dust in dangerous quantity, entries may be advanced 75 feet ahead of the air and rooms 90 feet. The law makes it the duty of the mine foreman to see that these provisions are carried out faithfully.

QUES.—How would you proceed to examine a gaseous mine to ascertain its true condition?

ANS.—Having carefully prepared his safety lamp and having examined the ventilating fan, the foreman or examiner should enter the mine by the intake air, if practicable, or proceed at once to the foot of the downcast shaft and ascertain that the usual volume of air is passing into the mine. Then, following the air current in its course, each entry, road and working place must be carefully examined for gas and other dangers that may be present. Where gas is discovered or timbers are found to have been dislodged by a shot, or a loose piece of roof is observed, and these dangers cannot be removed at the time, the place must be safeguarded by a proper danger signal placed at each entrance to warn men not to enter the place. It is always better to remove any danger at the time it is found, if this is practicable, but the time allotted to make the examination of a mine in the morning will not generally admit of this being done.

Having completed his rounds, the examiner must make out a report, stating the exact location of any dangers he may have found and their character. This report must be made in a book kept at the mine for that purpose and signed by the examiner, immediately on his return to the mine entrance or shaft bottom. He must then report to the foreman and withhold any checks of miners whose places he has found to be unsafe for work and not permit them to enter their places until those dangers are removed.

QUES.—How would you determine the quantity of air passing where the sectional dimensions of the entry are: Width, 10 feet; height, 5 feet 6 inches; and the anemometer registers 430 feet as the velocity of the air current?

ANS.—The sectional area of this airway is 10x5½=55 sq. ft. Then, assuming the anemometer reading represents the average velocity of the air current, the volume of air traveling in this entry is 55x430=23,650 cu. ft. per min.

QUES.—What, in your opinion, are the causes producing explosions in mines in this and other states; and what can be done to prevent these disasters?

ANS.—Some of the more common causes of explosions of gas and dust in mines are the following: Inadequate ventilation allowing the accumulation of gas in working places and void or abandoned portions of the mine; lack of thorough inspection and removal of accumulations of gas and dust; excessive use of black powder in blasting; overcharging of holes; drilling a hole too deep on the solid, or blasting off the solid; insufficient tamping, or tamping with coal slack or other inflammable material; failure to use permissible powders; failure to employ competent shotfirers to examine, charge and fire all shots except any that may, in their judgment, be unsafe; and, finally, lack of mine discipline and the enforcement of mine discipline and the enforcement of mine regulations and mining laws.

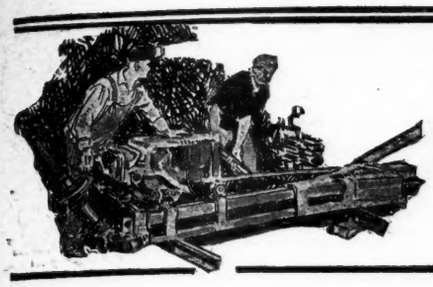
REGULATION FOR PREVENTION

To prevent, as far as possible, the recurrence of these disasters, strict mine discipline is required; also, a thorough inspection of the mine at regular intervals, by competent mine examiners, and a strict compliance with all mining laws and regulations, by mine officials and mine workers, are absolutely necessary. Where conditions require, all shots should be fired by competent shotfirers who are authorized to examine, charge and fire all shots that in their judgment are safe. A reliable and adequate system of ventilation must be provided and the roads, airways and working places of the mine kept free from accumulations of gas and dust.

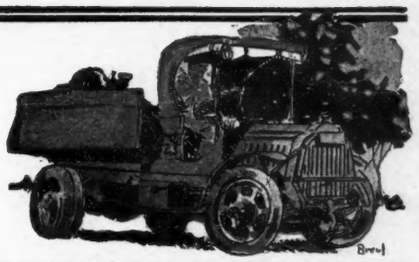
QUES.—If the fan engine or the motor actuating the fan should break down at a mine of which you are foreman, what effect would this have on the ventilation of the mine, and how would you proceed to keep the mine in operation for the balance of the day?

ANS.—The breaking down of the engine or motor operating a ventilating fan and the resulting stoppage of the fan would, in most every instance, necessitate the shutting down of the mine and withdrawing of the men, until the ventilating apparatus could again be put in operation. It would only be possible to continue the operation of a mine after the breaking down of the ventilating machinery, if some other means are at once available for producing necessary and adequate ventilation.

It may happen that a shaft mine will still have sufficient natural ventilation to permit work to be continued in some sections, provided the mine is generating no gas. Or, it may be possible to increase the circulation in the mine by means of a fire basket hung in the upcast shaft, or by erecting a small temporary furnace at the foot of that shaft. At times, use can be made of a steam jet placed at the bottom of the upcast shaft to increase the circulation and permit work to be continued in the mine. Otherwise, the men must be withdrawn and the mine shut down for repairs.



COAL AND COKE NEWS



Coming Meetings

American Society of Mechanical Engineers will hold its annual meeting Dec. 2-5 in New York. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

Canadian Mining Institute will meet Nov. 26-28, in Vancouver, B. C., Canada. Dr. E. T. Hodge, professor of geology at the University of British Columbia, has been appointed general secretary of this meeting.

Coal Mining Institute of America will hold its 33rd annual meeting Dec. 3 and 4 at Pittsburgh, Penn. Secretary, H. D. Mason, Jr., Mine Safety Appliances Co., Pittsburgh, Penn.

American Mining Congress will hold its annual convention at the Planters' Hotel, St. Louis, Mo., Nov. 17-21. Secretary, J. F. Callbreath, Muncey Building, Washington, D. C.

Recent Coal and Coke Patents

Mining Machine. W. E. Young, Uniontown, Penn., 1,315,271. Sept. 9, 1919. Filed May 3, 1919. Serial No. 294,431.

Apparatus for Burning Powdered Coal. A. J. Grindle, New-Castle-on-Tyne, and C. H. Stevenson, Gateshead, Eng., 1,315,385. Sept. 9, 1919. Filed Dec. 18, 1918. Serial No. 267,373.

Apparatus for Using Powdered Coal W. H. Stevens, Altoona, Penn., 1,316,399. Sept. 16, 1919. Filed March 31, 1916. Serial No. 87,962

Coal Handling Plant. C. S. Williamson, Chicago, Ill., 1,316,129. Sept. 16, 1919. Filed Feb. 26, 1916. Serial No 80,577.

Locomotive Boiler Furnace. J. C. Martin, Sausalito, Cal., 1,316,628. Sept. 23, 1919. Filed Jan. 31, 1919. Serial No. 274,585.

Trade Catalogs

Heat Treated Gearing. R. D. Nuttall Co., Pittsburgh, Penn. Bulletin No. 25. Pp, 24; 6 x 9 in.; illustrations. Notes the general treatment of gears to insure better service both in manufacture and use.

Helical Gearing in Electric Railway Service. R. D. Nuttall Co., Pittsburgh, Penn. Bulletin No. 26. Pp. 19; 8⅜ x 11 in.; illustrations. An analysis of Nuttall gear performance in electric railway service with comments of railway officials.

Explosives and Miscellaneous Investigations.. Department of the Interior. Bureau of Mines. Bulletin 178-D. Illustrated; pp. 89 to 107; 5¾ x 9⅛ in.

Typical Graphic Records. The Esterline Co., Indianapolis, Ind. Pp. 24; 8¼ x 11 in.; illustrated. A description of the type of curve drawing instrument and illustrations of its use in various industries.

Coal. The Underfeed Stoker Co. of America, Book Bldg., Detroit, Mich. Booklet. Pp. 31; 4¾ x 7 in.; illustrated. Prepared by R. T. Gray, advertising engineer, for the Underfeed Stoker Company. Gives analyses of coal from various sections of the country, as well as other information on coal consumption.

Flexible Shaft. Stow Manufacturing Co., Inc., Binghamton, N. Y. Bulletin No. 104. Pp. 56; 5¾ x 8¾ in.; illustrated. A price list and catalog of Stow portable electric tools, electric motors and special machines. This company specializes in flexible shafting.

Stow Motor-Driven Tools. Stow Manufacturing Co., Inc., Binghamton, N. Y. Bulletin No. 3. Pp. 27; 5¾ x 8¾ in., illustrated. A catalog describing the company's drills and grinders.

Fluid Meters for Low Pressure Gas and Air. Bailey Meter Co., Cleveland, Ohio. Bulletin No. 30. Pp. 15; 7¾ x 10½ in.; illustrated. Notes uses, principles of operation and characteristics.

The Nation's Market Place. Walter A. Zeluicker Supply Co., St. Louis, Mo. Bulletin No. 270. Pp. 56; 3½ x 8½ in., illustrated. A list of railroad supplies and equipment; power and industrial plant machinery; contractors' equipment.

Personals

C. M. Snyder, formerly safety inspector of the Hillman Coal and Coke Co., of Pittsburgh, Penn., has been promoted to the position of district superintendent. His district embraces the mines operated by the United Coal Corporation, prior to its absorption by the Hillman company.

Robert MacFarland, superintendent of the Hillman company's Ella mine at Sunnyside, has been promoted to the position of safety inspector to succeed Mr. C. M. Snyder.

David Dunn, formerly mine-foreman at the Ella mine of the Hillman Coal and Coke Co., has been made superintendent of the Ella mine to succeed Mr. Robert MacFarland.

E. V. Freeman, first lieutenant of infantry, A. E. F., has returned to the Bluefield, W. Va., office of the Westinghouse Electric and Manufacturing Co., and will handle the sale of power apparatus in eastern Kentucky, with field headquarters at Middlesboro, Ky. **J. A. Hammond,** who came from the coal fields of western Pennsylvania, to join the Bluefield sales force of the Westinghouse company, will handle the sale of supply apparatus in the Kentucky territory mentioned above.

A. Beveridge, general manager of the Sabine Collieries Co., of Otsego, Wyoming County, W. Va., was brought to Beckley in Raleigh County recently in a dying condition, it was thought. Mr. Beveridge was hurried to a hospital on a special train on the Virginian railroad. He was badly injured in a monitor accident at the mines; at the same time another man was killed and several others reported injured. He is a man 55 or 60 years of age and came to West Virginia from the middle west.

Henry Devlin, who has been an inspector of mines in British Columbia since Feb. 1913, has resigned in order to take a position with the Canadian Collieries, Ltd. Previous to entering the civil service, Mr. Devlin was mine manager at South Wellington, Pacific Coast Mines.

Dudley Michel, who for five and one-half years has been attached to the staff of the Department of Mines, British Columbia, as instructor and organizer in first-aid and mine-rescue work, has left the service. He is taking a position with the Giant Powder Co.

Hugh Morrow is unofficially announced to have been appointed assistant to president J. W. McQueen, of the Sloss-Sheffield Steel and Iron Co. It is further stated that vice-president L. Sevier is soon to leave this company and that he will be succeeded by Mr. Morrow.

Arthur A. Allan, of Wilkinsburg, a suburb of Pittsburgh, Penn, recently resigned as assistant general superintendent of the United Coal Corporation, has accepted the position of superintendent of the Westmoreland-Fayette Coal and Coke Company.

Edwin Ludlow announces that he has opened an office at 149 Broadway, New York City, as consulting engineer, specializing in coal and coke.

David L. Wing contributed largely to the preparation of the series of coal cost reports, the first of which appeared

DAVID L. WING

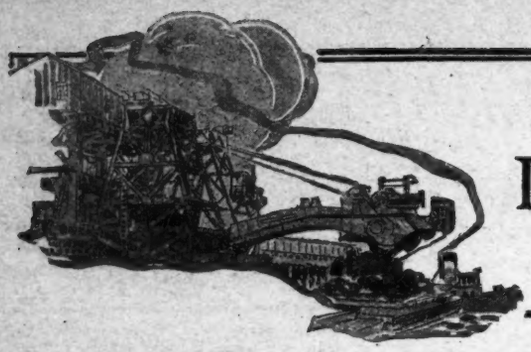
recently covering the central and southwest bituminous fields of Pennsylvania. During the course of this cost work, done by the Federal Trade Commission, many coal operators throughout the country have been brought in contact with Mr. Wing. Many employees, present and former, were under the general direction of D. L. Wing in the preparation of these reports.

Col. Noel Marshall has retired from the presidency of the Standard Fuel Co., of Toronta, Can., and his son, **Lt.-Col. K. R. Marshall,** has been elected to his place. A banquet and presentation was tendered the former by his competitors in the city, in commemoration of his 50 years in the coal trade.

George Roberts, who has been mine-foreman for the Milbar Coal Co., at Dixonville, Penn., has been transferred to the new plant of this company that is being opened at Diamondville, Penn. Mr. Roberts is succeeded by **Charles Abbott,** formerly mine-foreman of Vicot No. 26 mine of the Russell Coal Mining Co., at Clymer, Penn. These towns are all in Indiana County.

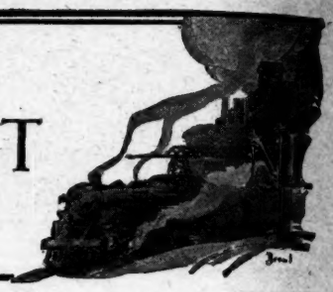
G. N. Pfeiffer, who has built up an engineering business in the southern part of Illinois, recently formed an engineering partnership with **A. C. Williams** The new firm of **Pfeiffer & Williams,** consulting engineers, has headquarters at Herrin, Ill. After this matter had been arranged, Mr. Williams disposed of his engineering office in Pittsburg, Kan.

F. D. Buffum, 3130 Middletown Road, Pittsburgh, Penn., a contractor for shafts, slopes and general construction, has gotten up a sheet of data on shaft construction for general distribution. This data should be interesting and of service to engineers and others having to do with shafts and slopes. "There is little literature on this particular subject," says Mr. Buffum, "and the sheet of data will be forwarded upon request."



MARKET DEPARTMENT

EDITED BY ALEX MOSS



Weekly Review

Coal Consumers Not Worried by Impending Strike—Soft Coal Market Generally Inactive, Except in Middle West—Anthracite Domestic Coals in Good Demand—More Vessels Allotted to American Coal Trade By Foreign Governments

Production of soft coal keeps pace with demand. No undue anxiety is shown by buyers to lay in surplus stocks against the possibility of a nation-wide strike of bituminous coal miners on November 1, consumers generally holding to the belief that the Government will step in at the last moment, should negotiations fail, and insist that the mines be operated.

Truth is, every manufacturing plant of any size on the Atlantic Seaboard has ample soft coal in reserve, and this accounts in great measure for the apathetic state of the market. Particularly is this evident in New England, where there is no buying interest whatever so far as steam coals are concerned.

Quite a different picture is presented by conditions in the Middle West territory. Steam coals, which heretofore were quite a problem to Middle West operators, are now selling at good prices, and instead of being difficult to dispose of are bringing premiums for prompt shipment. The demand for the prepared sizes of domestic coal from Illinois and Indiana mines is also keen.

There have been no new developments in prices the past week, though if the present negotiations with the miners ends in a strike it will mean that what little coal is produced will bring a large premium. At any event, if the miners succeed in obtaining an increase in wages it will add materially to the cost of the coal.

The slight falling off in the output of soft coal reported for the week ended October 4 can be traced directly to the lessened demand from the steel industry. The total production of bituminous coal (including lignite and coal made into coke at the mines) during this period was 11,470,000 net tons as against 11,606,000 net tons for the preceding week. The total output of coal has not been seriously reduced by the steel strike, for the general demand is sufficiently active to absorb the tonnage released by the steel industry.

Anthracite mines are striving to their utmost to supply the demand for the domestic sizes. Particularly urgent is the call for these coals from New England, for while that territory is overstocked with soft coal, many sections are in need of a large tonnage of the domestic sizes of hard coal. Steam sizes, on the other hand, are being disposed of with difficulty. Barley is the most troublesome size, as it encounters the competition from bituminous.

The output of anthracite for the week ended October 4 is estimated at 1,921,000 net tons, as compared with 1,964,000 net tons for the week preceding. While there has been some improvement in the quantity of domestic sizes shipped from the anthracite mines during the past week, the claim is made that shipments are still below normal for this time of the year.

The export and bunker trade is still active, with an upward trend noticeable in the prices of Pocahontas and New River coal. As a result of the irrefutable charges made recently by the U. S. Shipping Board, that the vessels of European countries in dire need of coal are being diverted to more profitable cargoes, Denmark, Sweden and Italy have assigned additional ships to ply in the American coal trade. Denmark has placed 16 ships with a total tonnage of 61,000 in this service.

PITTSBURGH

Coal Industry Feels Steel Strike—Lake Shipments Light — Possibilities of Miners' Strike Stimulates Demand in Some Quarters.

The steel strike has lost just a little more ground in the past week, but not enough to make a noticeable increase in the industry's consumption of coal. The coal industry feels the effect of the strike more than in the first week or two, when there were accumulated demands in other quarters that could be met with the coal released from the steel industry. Fears of a coal strike November 1, on the other hand, have tended to stimulate coal demand in some quarters.

Lake shipments are now quite light. The boats have been moving more slowly and there is little demand left.

The large byproduct coke plants in Youngstown and Cleveland are operating to an extent, but on the whole are hardly taking more than one-fourth as much coal as normally.

The coal market is somewhat easy compared with conditions just before the steel strike, running approximately as follows: Slack, $1.90@2.10; steam mine-run, $2.10@2.40; gas mine-run, $2.20@2.50; prepared gas, $2.60@2.80; per net ton at mine, Pittsburgh district.

CONNELLSVILLE

Furnace Coke Stiffened Sharply — Foundry Coke Demand Good—Production Light.

The coke market has experienced a sharp stiffening after its recession due to initial effects of the iron and steel strike. Coke operators were quick to reduce production when so many blast furnaces were closed by the strike, and in the past week, with several furnaces resuming, the demand for coke has been quite active in proportion to the floating supply, and furnace coke has advanced fully 50 cents in the week, several sales having been made at $4.25, while there is no prospect of any standard coke being offered at less.

Production of soft coke has been unusually great, owing to so many ovens having lengthened their running time, up to, say, 96 hours, but this soft coke finds rather a ready sale, and at relatively good prices, usually $3.50 or more. Foundry coke has continued in good demand. In the past fortnight it has been off about 25 cents, as compared with prices just before the iron and steel strike, this being due not to lessened demand but to heavier offerings as a number of producers can supply more foundry coke now that their furnace coke requirements are decreased. We quote the market at $4.25 for spot and prompt furnace coke and at $5.75@6.25 for foundry coke, per net ton at ovens.

The "Courier" reports production in the Connellsville and Lower Connellsville region in the week ended October 4 at 157,600 tons, a decrease of 28,520 tons.

MID-WEST REVIEW

The coal market on all kinds and sizes has been booming for the last week. Some of our largest industries are picking up as much open coal on the market as they are able to get, believing that this coal will be handy a little later on. Steam coals which heretofore have been a drug on the market are selling at good prices, and premiums are being offered for prompt shipments. The demand for prepared sizes, going to the retail trade is very strong. In fact the average operator can get more than a dollar above the present current price, if he so desires. Operators and distributors alike, but more especially operators, are maintaining prices at a level far below what they could actually get for their coal if they so desired. The industry as a whole is to be very much commended for the strong stand it has taken against profiteering. It is no exaggeration to say that the average operator in Illinois and Indiana could get anywhere from 75 cents to $1.50 per ton more for domestic ocal than the present current price.

The labor situation appears to be at a deadlock, although the general opinion now seems to be that there will be no secession in mining on Nov. 1. It is thought that the operators and the United Mine Workers will be able to patch their differences, and it is hoped that this will prove the case.

CHICAGO

Good coal is being invoiced at reasonable figures, but those desirous of placing big orders at this time are having difficulty getting operators and distributors to accept additional business, as the mines now have enough business on their books to run straight through.

High-grade domestic coals from southern Illinois are selling at from $3.10 to $3.25. Good domestic coals from the Springfield and other districts are bringing a little less. Steam coals are firm. Two-inch screenings bring around $2.20 and mine-run anywhere from $2.35 to $2.75, according to the district, and the quality. Eastern coals are almost impossible to get. Good splint block and Kentucky block are bringing anywhere from $4.50 to $5, mines. Pocahontas coal is practically impossible to get. Good third vein Pocahontas or New River is bringing around $5.50 to $5.75 for the prepared sizes and $4.25 for the mine-run. The anthracite people have discontinued taking business, having all they can do to fill the orders on their books.

It is thought that a short spell of cold weather will show the public just how serious the present coal situation is.